Series 1951, No. 4

Issued May 1959

SOIL SURVEY

Bitterroot Valley Area, Montana

OUR SOIL ★ OUR STRENGTH

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service

In cooperation with

MONTANA STATE AGRICULTURAL EXPERIMENT STATION

How to Use THE SOIL SURVEY REPORT

THIS SURVEY of the Bitterroot Valley Area will help you plan the kind of farming that will protect your soils and provide good yields. It describes the soils; shows their location on the map; and tells what you can do with them under different kinds of management.

Find Your Farm on the Map

In using this survey, start with the colored soil map which is bound in the back of this report. These 119 map pages, if laid together, make a large map of the Bitterroot Valley Area. Towns, roads, rivers, and other landmarks are shown on these map sheets.

To find your farm or ranch, use the index to map sheets. This is a small map of the Area on which numbered rectangles have been drawn to show what part of the Area is covered by each sheet of the large map.

When you have found the map sheet for your farm, you will notice that each area of each soil is outlined by a boundary, and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map.

Suppose you have found on your farm an area marked with the symbol Ha. You learn the name of the soil this symbol represents by looking at the map legend. The symbol Ha identifies Hamilton fine sandy loam, level.

Learn About the Soils

Hamilton fine sandy loam, level, and all the other soils mapped are described in the section Soil descriptions. Soil scientists, as they walked over the fields and through the forests, mapped and described the soils; dug holes and examined surface soils and subsoils; measured slopes with a hand level; noted differences in growth of crops, weeds, brush, or trees; and, in fact, recorded all the things about the soils that they thought might affect their suitability for farming or ranching.

After they mapped and studied the soils, the scientists judged what use a soil should have under three different types of agriculture—irrigation farming, dryland farming, and livestock ranching. Each soil was placed in a capability unit or range site. Each capability unit or range site contains a group of soils that need and respond to about the same kind of management.

In the section, Use and Management of Soils, you will find that Hamilton fine sandy loam, level, is in capability unit I-1 for irrigation farming, in capability unit IIIe-1 for dryland farming, and in range site Sy-12 for livestock ranching. Tables for each type of agriculture will tell you what crops are most suitable and what kind of management is needed. Another table in the same section estimates yields you can expect to harvest from certain crops on this soil.

Make a Farm Plan

For the soils on your farm or ranch, compare your yields and practices with those given in this report. Look at your fields for signs of erosion or overgrazing. Then decide whether or not you need to change your methods. The choice, of course, must be yours. This survey will aid you in planning new methods, but it is not a plan of management for your farm or any other farm in the county.

If you want help in farm planning, consult the local representative of the Soil Conservation Service or the county agricultural agent. Members of your State experiment station staff and others familiar with farming in the Bitterroot Valley will also be glad to help you.

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CORRELATED BY B. H. WILLIAMS, SOIL SURVEY[1]

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE MONTANA AGRICULTURAL EXPERIMENT STATION

THE BITTERROOT is an intermountain valley in southwestern Montana. It is a region of great scenic beauty and pleasant climate. The winters are comparatively mild, and the summers moderate. The average annual precipitation ranges from 12 to perhaps 30 inches.

The main valley is about 65 miles long and is 10 miles wide at the widest part. The East Fork and the West Fork of the Bitterroot River extend from the south end up narrow valleys for another 25 to 30 miles. At one place, the valley of the East Fork widens into a basin about 20 square miles in area.

The first white settlement in the valley was St. Mary's Mission, established in 1841 by Father DeSmet. It was near the site of the present town of Stevensville. Settlement reached a climax during the orchard boom of 1900 to 1915. Another but more moderate influx of settlers has occurred since World War II.

Agriculture ranges from intensive cropping under irrigation to ranching. Lumber production is the most important industry. Trout streams and herds of big game are abundant in the nearby mountains.

Many crops are suited to this area. Among them are sugar beets, the small grains, alfalfa, clovers, several important pasture and hay grasses, potatoes, peas, beans, and some other vegetable crops, sour cherries, hardy apples, raspberries, strawberries, and certain other fruits. All the main types of livestock do well.

Some soils of the Bitterroot Valley Area are as fertile and productive as any in the country. Others are, as described by Lt. Clark of the Lewis and Clark Expedition, "pore and stoney" (*10*).

Most soils on the bottom lands of the Bitterroot River are very shallow to barely moderately deep over loose sands and gravels. They occupy a strip about ½ mile to 2 miles wide.

Many deep soils occur on the gently sloping fan-terraces and high benches of the east side. They are productive soils and support intensive irrigation farming. Above the Bitterroot Valley Irrigation District canal is an extensive bedrock area of grassland soils. Grazing and dryland farming are important there. The mountains above about 5,000 feet are heavily timbered.

The west side of the valley is distinctly different from the east side. The dominant vegetation is evergreen forest with open parklands. Soil materials are transported granites and related rocks. They include both glacial till and outwash deposits, and they appear to be of Pleistocene age. Only a few outcrops of Tertiary materials similar to those of the east side occur.

Two general physiographic levels occur on the west side of the valley. The lower level consists of relatively recent, fairly smooth, sloping fan-terraces bordering the bottom lands of the Bitterroot River and extending up the side valleys. The soils are very shallow to moderately deep. They developed over unweathered granitic stones and gravel. The older fans are higher and more or less dissected. The soil materials came from rocks similar to those on the younger fans but are more weathered. They include partly weathered cobblestones and gravel; weathered, compacted cobblestones and gravel; strongly weathered gritty clays; and friable silts. Soils on each of these materials support both grassland and forest.

The soils on the west side of the valley are used mostly for general farming under irrigation and timber production. The west side is generally a much poorer agricultural area than the east side. The precipitous Bitterroot Mountains, composed mostly of granite, rise abruptly to the west.

The soils of Sula Basin are predominantly grasslands. They support a cattle-ranching economy.

This survey was made to provide basic soils information needed for the orderly development of the valley and its economy. The United States Department of Agriculture and the Montana Agricultural Experiment Station cooperated in surveying the soils. The survey was completed in 1951. Unless otherwise stated, information in this report refers to conditions at the time the survey was completed.

Description of the Area

In this section the location, physiography, climate, early history, and present culture of the area are described. This background will help you to understand the use and management of the soils of the Bitterroot Valley Area.

Location and Extent

The Bitterroot Valley Area is in southwestern Montana, west of the Continental Divide (fig. 1). It is an irregularly shaped area extending south along the Bitterroot River from Lolo, which is 10 miles south of Missoula, Montana. It includes the valley of the Bitterroot River, the valleys of the East and West Forks,

[1] The soil survey was made and correlation was done while Soil Survey was part of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

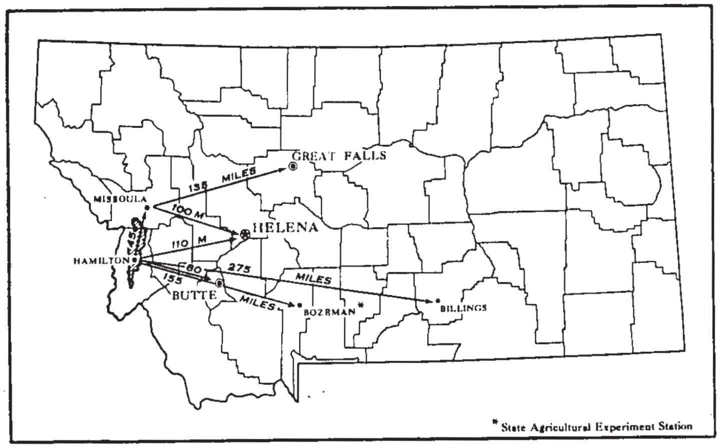

Figure 1.—**Location of the Bitterroot Valley Area in Montana.**

the adjacent benches and foot slopes, and strips of mountainous land in the Bitterroot Mountains on the west and in the Sapphire Mountains on the east. The Area is 84 miles long from north to south and varies in width from 1 mile to 15 miles. It covers 834 square miles, of which approximately 814 are in Ravalli County and 20 are in Missoula County. All of the land in Ravalli County that is suitable for cultivation is included in the Area.

The valley land east of the main channel of the Bitterroot River is known locally as the east side; that west of the river is known locally as the west side. The valleys of the East Fork and the West Fork at the southern end of the survey Area are commonly known as the upper valleys. The northern part of the Area is called the lower valley.

Physiography

The Bitterroot Valley Area is part of the Rocky Mountain physiographic province (*3*)[2]. It is entirely within the drainage basin of the Bitterroot River. Elevations above mean sea level in the drainage basin vary from about 3,150 feet where Lolo Creek joins the Bitterroot River to 10,131 feet at the summit of Trapper Peak, which is just outside the survey Area. Other high points in the Bitterroot Mountains are Como Peaks, 9,552 feet; Ward Mountain, 9,010 feet; St. Mary's Peak, 9,335 feet; and St. Joseph's Peak, 9,570 feet. High points in the Sapphire Mountains are Cleveland Mountain, 7,181 feet; Willow Mountain, 7,785 feet; Palisade Mountain, 8,435 feet; and Congdon Peak, 8,870 feet. All of these are outside the survey Area but within the drainage basin. Elevations along the divide to other watersheds range from 6,000 to 9,000 feet. The Bitterroot Branch of the Northern Pacific Railroad parallels the Bitterroot River. Elevations along this branch railroad are 3,187 feet at Lolo, 3,312 feet at Stevensville, 3,524 feet at Hamilton, and 3,802 feet 1½ miles north of Darby. The elevation at Connor, near the junction of the East and the West Forks, is 4,030 feet. The fall of the main river is thus about 15 feet to the mile.

In some of the mountainous parts of the drainage basin, local relief is 3,000 to 4,000 feet. In the valleys local differences are as much as 200 to 300 feet around the edges of prominent benches. In most places, however, there is much less variation.

The Bitterroot Valley

The Bitterroot Valley proper is a long basin about 65 miles from north to south and as much as 10 miles wide. It extends from Lolo, on the northern boundary of the survey Area, to Connor, where the East and West Forks combine to form the Bitterroot River. To the west, the bold Bitterroot Mountains rise abruptly with a remarkably even front slope cut by deep parallel canyons. To the east, and far less pronounced in outline, are the foothills that gradually lead up to the Sapphire Mountains.

The floor of the valley is underlain by alluvium of great depth. A well drilled at Corvallis shows that the deposits are at least 1,100 feet thick (*6*). They may possibly be twice that thick. The physiographic subdivisions of the valley are (1) the Bitterroot flood plains, (2) the low fan-terraces of the side creeks, (3) the high Pleistocene fans, benches, and moraines of the west side, and (4) the high Tertiary benches of the east side.

The Bitterroot flood plains.—The flood plains of the Bitterroot River consist of an intricately channeled strip of alluvium that is as much as 3 miles wide in the main valley. Very narrow strips extend up the East and West Forks and the larger side creeks. The alluvium is predominantly sand and gravel of mixed origin. The flood plains have been developed by the downcutting of the lower edges of the side fans and the re-sorting of the material. Apparently, the river has deposited but little material directly.

The depth to the water table varies from a few inches to a few feet. The water supply is adequate for domestic use and the water is of good quality. In most places, there would be enough water for irrigation wells.

The principal soils are members of the Chamokane, Slocum, and Kenspur series.

The low fan-terraces of the side creeks.—The fan-terraces of the side creeks spread from the canyons on each side toward the center of the valley. In some places they merge into the flood plains; in other places they end in abrupt drops of as much as 20 feet. Although only a few feet above present creek channels, these fan-terraces are seldom, if ever, flooded. The surfaces are generally smooth. Downstream gradients are 1 to 3 percent. Around the edges of the fan-terraces there are generally narrow foot slopes. These have steeper gradients, and they merge into the edges of the higher benches. Next to the flood plains at Darby, Hamilton, and Woodside, the land forms are more like terraces than like fans. In the upper valley both fans and terraces exist, but they are narrow, dis-

[2] Numbers in italics refer to Literature Cited, page 128.

sected, and difficult to trace. Depth to ground water varies from a few inches to about 25 feet. The water is of good quality, and the supply is ample for domestic use. In many localities, it would probably support irrigation wells. The underlying materials are fresh hard sands, gravels, and cobblestones derived from various rocks. These are mantled to varying depths with fine earth, that is, material finer than gravel.

On the west side, except on the Lolo Creek fan, the coarse fragments are chiefly granites, gneisses, and rhyolites. In some places quartzites and argillites are mixed in. The fine earth is generally gritty and less than 2 feet thick. Some places have no fine earth mixed into the coarse fragments.

The predominant soils are members of the Victor, Chereete, Clark Fork, Larry, St. Joe, and Poverty series. A large area of peat occurs about 6 miles south of Hamilton.

On the fans along Lolo Creek on the west side of the valley and along Eightmile Creek on the east side, the coarse fragments are chiefly quartzites and argillites. They are mixed with fine earth to depths of 20 inches or more. The principal soils belong to the Lolo series.

Along Threemile Creek and Ambrose Creek, the fans are underlain chiefly by fine gravels and sands washed from areas of weathered granite. The dominant soils are members of the Lone Rock and Greeley series. Some small areas are of Grantsdale and Hamilton soils, and along the creek bottoms are Slocum and Gallatin soils.

The coarse fragments underlying the fans of the Burnt Fork of the Bitterroot River are mostly cobblestones of quartzite and argillite. In some places, there is almost no fine earth. In other places, a mantle of calcareous silt of varying thickness occurs. The principal soils are members of the Dominic, Corvallis, and Gallatin series, and peat.

On the low fan-terraces of the east side between Stevensville and Grantsdale, the coarse fragments are from a mixture of various rocks. The soils contain more gravel than cobblestones. Calcareous silts, which vary in thickness from a few inches to several feet, mantle the coarse fragments. The principal soils are members of the Hamilton, Corvallis, Grantsdale, and Dominic series.

The fans along Sleeping Child Creek are mostly coarse sand and fine gravel washed from weathered granite. On the fan slopes, the principal soils are members of the Breece series. Gallatin soils occur on the creek bottom.

The high Pleistocene benches of the west side.—The high fans and moraines of the west side form a set of nearly level to hilly benches at the base of the Bitterroot Mountains from Lolo to Connor. All except the bench just south of Lolo were formed early in the glacial (Pleistocene) epoch as outwash fans and glacial moraines. The more prominent moraines are south of Lost Horse Creek (*1*). The benches have been dissected by the Bitterroot River and the west-side creeks; the topography is now undulating to hilly, but the general slope is toward the valley. Only a few remnants of the original fan surfaces are left. The largest of these are on the benches just west of Darby. Depth to ground water varies. In swales and in irrigated areas water may be within a few feet of the surface. Elsewhere it may be much deeper. Most farms have a good supply of water for domestic use.

The materials under most of the fans and moraines are boulders, cobblestones, and pebbles derived chiefly from granite and gneiss. These have been so strongly weathered that many of them can be crushed by hand. The dominant soils on these materials are members of the Charlos, Bass, Blodgett, Lick, Como, and Woodside series. In one area between Big Creek and Sweathouse Creek, the material is mostly gravel derived from quartzites and argillites. The soils there are of the Skalkaho series. One area of about 3 square miles in Missoula County consists of gravel derived chiefly from micaceous schists, quartzites, and argillites. The soils there are principally micaceous variants of the Skalkaho series.

The area just south of Lolo is underlain by Tertiary materials similar to those of the east side. Tertiary materials also outcrop in bluffs along Blodgett and Lick Creeks. However, where the topography permits soils to develop along these creeks, the Tertiary materials are buried too deeply to contribute parent material to the soils. South of Rock Creek, some areas are mantled with silt 15 to 60 inches or more in thickness. This silt was probably deposited by wind. The principal soils developed in these silts are members of the Sula and Gorus series.

The high Tertiary benches of the east side.—The high benches of the east side are underlain chiefly by stratified, unconsolidated to weakly consolidated loams, clays, silts, sands, gravels, and volcanic ash of the Tertiary period. Except for the ash, the materials appear to be normal alluvial sediments. They are older than the parent materials on the west side. In places, particularly on the Burnt Fork benches, some strata have been lime-cemented into hard masses. Some of the thicker gravel deposits around the edges of the benches in which the Riverside soils have developed may be of the Pleistocene (glacial) epoch. The mantles of limy, more or less gravelly and cobbly fine earth in which the Burnt Fork and Willoughby soils have developed, and the silty wind deposits in which the Amsterdam soils have developed, are also probably Pleistocene.

Only parts of the original surfaces of the Tertiary benches remain. The larger remnants are those on the benches north and south of Burnt Fork Creek and those east of Hamilton. These areas are nearly level to gently sloping and smooth. The intervening areas have been more or less dissected and eroded and are now gently to strongly sloping. The overall slope is toward the valley. The bench edges are steeply sloping to broken. Local relief around these edges varies as much as 200 feet. Depth to ground water varies. At some locations, good water for domestic use is hard to find at reasonable depths.

The principal soils of the Tertiary benches are mem-

bers of the Burnt Fork, Willoughby, Riverside, Bitterroot, Amsterdam, Skalkaho, and Ravalli series.

The upper valleys.—The valley of the West Fork of the Bitterroot River is no more than a mile wide at any point, and in many places it is much less. The narrow flood plain is bordered first on one side and then on the other by low terraces and fans. These are underlain by loose sands and gravels derived from a variety of rocks. The alluvium is not especially thick. Bedrock outcrops at some places in the river bed.

Mountains rise precipitously on both sides of the valley. Small remnants of high benches occur where the West Fork joins Nezperce Fork and Overwhich Creek. A pocket of Tertiary sediments occurs on Coal Creek. The principal soils are members of the Clark Fork, Chamokane, and Gallatin series.

For about 10 miles above Connor, the East Fork flows in a narrow valley like that of the West Fork. The valley widens out at Cameron Creek, north and east of Sula, to form Sula Basin and French Basin. Together, these basins of flood plains and rolling hills cover about 20 square miles. Materials underlying the flood plains are mixed gravels mantled with loams and clays. The soils are chiefly of the Gallatin series. Parts of the hills are weathered granitic outwash like that of the high fans on the west side of the main valley; other parts are Tertiary sandstones and silts; and the remainder is weathered granite bedrock. Wind-deposited silts and sands mantle some areas. The principal soils are members of the Lick, Ravalli, Brownlee, Duffy, and Stecum series, and the Sula loam variant.

Before the East Fork reaches Sula Basin, it flows in a narrow mountain valley that has a complex topography of flood plains, broken terraces, and fans. The principal soils are members of the Clark Fork and Chamokane series.

The Bitterroot Mountains

The Bitterroot Mountains lie to the west of the main valley of the Bitterroot River. This range is part of the eastern boundary of the Idaho batholith, which is composed of quartz monzonite. In many places the mountains rise to elevations of more than 9,000 feet. Trapper Peak, near the southern end of the range, is 10,131 feet high.

Probably three or more cycles of glaciation have affected the topography of the Bitterroot Mountains (*9*). In the northern part of the range, the glaciers did not reach as far as the valley, and the notches along the range front are typical V-shaped stream cuts. South of the present town of Hamilton, the glaciers advanced into the valley and formed U-shaped notches in the range front. The regular 18- to 26-degree (32- to 48-percent) slope of the range front suggests a great fault scarp, but not all authorities agree that a fault exists here. The range front is almost entirely gneiss, but locally it is a schist. A few of the higher peaks are capped with pre-Cambrian quartzites, argillites, and limestones[3] (*7, 6, 8*).

[3] GROFF, SIDNEY L. PETROGRAPHY OF THE KOOTENAI CREEK AREA, BITTERROOT RANGE, MONTANA. Typewritten thesis, Mont. State Univ., Missoula. 1954.

The Sapphire Mountains

The physiography of the Sapphire Range, on the east side of the main Bitterroot Valley, is in strong contrast to that of the Bitterroot Range (*6*). In general, the Sapphire Range resembles a broad dissected plateau. Elevations of peaks range from about 7,000 feet in the north to more than 8,500 feet in the south. Most of the streams flow northward and converge into a few major creeks before reaching the Bitterroot Valley. The foothills consist of many low spurs and ridges that ascend gradually from the Tertiary benches to the mountains. In the foothills are many gentle slopes of tillable soils.

The underlying sedimentary rocks are quartzites, hard sandstones, argillites, and limestones, all of the Belt series, which is pre-Cambrian in age. In many places the rocks are mantled by wind-deposited silts a few inches to a few feet thick. The principal soils on these formations are various types and variants of the Gird, Haccke, Cooney, Skaggs, Teton, Castner, Laporte, Trapper, and Holloway series.

The igneous intrusions belong to the light-colored quartz monzonite family of granites (*6*). They too are mantled in places with silty material that is now gritty because it is mixed with the weathered granite. The principal soils are members of the Brownlee, Duffy, Ravalli, Shook, Stecum, and Woodrock series.

Climate

The climate of the Bitterroot Valley is characterized by cool, pleasant summers and comparatively mild winters. Temperatures are less extreme both in summer and in winter than in the part of the State that is east of the Continental Divide. Hamilton has an average annual temperature of 46.1° F., an average January temperature of 25.4°, and an average July temperature of 67.8°. The normal number of days each winter with below-zero temperatures is less than 10. Snowfall is relatively light in the lower valley, and the mountains on nearly all sides protect the valley against high winds. There is scarcely enough rainfall to produce crops without irrigation.

The average length of the frost-free season at Hamilton is 126 days, from May 18 to September 21. At Darby, it is 112 days, from May 19 to September 8.

Climatic data recorded at Hamilton and Darby are given in table 1. These show the range for the lower valley. Complete records are not available for the higher locations, which generally are somewhat cooler and wetter than the valley floor and have shorter growing seasons.

As the elevation increases on either side of the valley, the amounts of rainfall and snowfall increase, the average temperature becomes lower, and the growing season becomes shorter. Precipitation ranges from 15 to 18 inches in the lower forested parts of the Area and the high grasslands on the east side, to probably 40 inches on the mountain summits. In the mountains, or in the valleys of the East Fork and West Fork, frosts may occur in any month of the year, and the average frost-free season is probably less than 100 days.

TABLE 1.—*Average temperature and precipitation at Hamilton and Darby, Bitterroot Valley Area, Mont.*

[Hamilton: elevation, 3,529 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Total for the driest year	Total for the wettest year	Average snowfall
	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December	27.6	66	−30	0.71	0.50	3.38	4.4
January	25.4	62	−36	.79	.70	.47	7.9
February	28.8	71	−39	.75	1.61	.54	7.4
Winter	27.3	71	−39	2.25	2.81	4.39	19.7
March	38.0	74	−13	.69	.57	1.49	3.7
April	46.8	90	1	.87	.09	1.03	.5
May	54.0	102	18	1.47	.14	2.92	.3
Spring	46.3	102	−13	3.03	.80	5.44	4.5
June	60.6	100	30	1.75	.04	3.15	([3])
July	67.8	103	33	.76	.02	1.13	([3])
August	66.0	102	32	.66	.12	.02	([3])
Summer	64.8	103	30	3.17	.18	4.30	([3])
September	56.9	98	18	1.00	.08	.57	([3])
October	46.0	90	−1	.91	1.25	.75	.4
November	35.8	72	−14	.81	.14	2.58	2.7
Fall	46.2	98	−14	2.72	1.47	3.90	3.1
Year	46.1	103	−39	11.17	[4] 5.26	[5] 18.03	27.3
[Darby: elevation, 3,815 feet]							
December	28.4	67	−28	1.37	.30	1.00	11.6
January	25.0	60	−36	1.32	.45	3.94	11.5
February	29.4	67	−35	1.34	.10	.81	13.1
Winter	27.6	67	−36	4.03	.85	5.75	36.2
March	37.0	75	−15	1.38	.91	.71	6.3
April	45.3	85	−2	1.01	1.03	1.65	1.5
May	52.0	95	19	1.56	.64	2.01	.7
Spring	44.8	95	−15	3.95	2.58	4.37	8.5
June	57.9	97	25	1.76	.91	1.62	([3])
July	66.2	104	31	.87	.90	2.00	([3])
August	63.8	103	25	.68	.90	.13	([3])
Summer	62.6	104	25	3.31	2.71	3.75	([3])
September	52.0	98	14	1.35	.01	2.52	.2
October	47.0	87	−3	1.12	.55	.94	2.0
November	36.0	72	−13	1.86	.51	4.54	6.5
Fall	45.0	98	−13	4.33	1.07	8.00	8.7
Year	45.0	104	−36	15.62	[6] 7.21	[7] 21.87	53.4

[1] *Hamilton*: Average temperature based on a 40-year record through 1955; highest and lowest temperatures on a 46-year record through 1952. *Darby*: Average temperature based on a 27-year record through 1955; highest and lowest temperatures on a 27-year record through 1952.

[2] *Hamilton*: Average precipitation based on a 45-year record through 1955; wettest and driest years based on a 45-year record in the period 1899-1955; snowfall based on a 42-year record through 1952. *Darby*: Average precipitation based on a 31-year record through 1955; wettest and driest years based on a 28-year record in the period 1909-55; snowfall based on a 21-year record through 1952.

[3] Trace.

[4] In 1899.

[5] In 1955.

[6] In 1935.

[7] In 1909.

Native Vegetation

The native vegetation of the Bitterroot Valley Area included associations of both grassland and forest plants. Grasslands occupied the fans and benches of the east side, the lower slopes and some higher southern exposures of the Sapphire Mountains, the Sula Basin and nearby mountain slopes, and parts of the west side fans and benches. Forests occupied most of the west side, the Bitterroot Mountains, and the upper elevations and lower north-facing slopes of the Sapphire Mountains.

The dominant species of grasses of the climax grasslands are generally believed to have been bluebunch wheatgrass (*Agropyron spicatum*), sandberg bluegrass (*Poa secunda*), and Idaho fescue (*Festuca idahoensis*). The last was important only in the more humid parts. Other important grasses were species of needlegrass (*Stipa* sp.), bluegrass (*Poa* sp.), wheatgrass (*Agropyron* sp.), basin wildrye (*Elymus cinereus*), and prairie junegrass (*Koleria cristata*). Various sedges, rushes, and moisture-loving grasses dominated in the imperfectly to poorly drained sites.

The more prominent broad-leaved plants and shrubs were big sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), arrowleaved balsamroot (*Balsamorhiza sagittata*), lupines (*Lupinus* sp.), milkvetches (*Astragalus* sp.), asters (*Aster* sp.), goldenrods (*Solidago* sp.), and thistles (*Cirsium* sp.). The bitterroot (*Lewisia rediviva*) grew on gravelly knobs and other exposed sites. Scattered conifers grew on steep rocky slopes and the granitic outwash areas of the west side. All of these and many other weedy plants are still prominent on the remaining native grasslands. However, it is probable that they were originally of only minor importance and that the bunchgrasses were the dominant vegetation.

Three general forest associations are important in the forest areas. At the lower elevations and on the drier southern exposures at higher elevations, ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) are the most common trees. Lodgepole pine (*Pinus murrayana*) grows in burned areas. At the higher elevations alpine fir (*Abies lasiocarpa*), Douglas-fir, spruce (*Picea mariana*), and lodgepole pine are the dominant trees. On the flood plains of the Bitterroot River the dominant trees are cottonwood (*Populus* sp.), willow (*Salix* sp.), and various conifers.

Early History, Organization, and Population

Before white men came to the Bitterroot Valley, it was the traditional home of the Flathead Tribe of the Salish Indian Nation. In spite of treaties, bribes, poverty, and great pressure, many of these Indians remained in the valley until 1891, when Chief Charlos finally gave up and led them to the reservation south of Flathead Lake.

The Bitterroot Valley was first visited by white men in September 1805 when Lewis and Clark, after a vain attempt to continue westward along the Salmon River, took the advice of Shoshone Indians and swung north-

ward from Idaho over Lost Trail Pass. After spending two nights and a day with friendly Flathead Indians encamped in Sula Basin, the party continued down the valley, camping near the sites of Grantsdale, Stevensville, and Lolo. Lt. Clark noted in his journal that "We passed through a land with pore and stoney soil." Sgt. Gass of the same expedition wrote of the "rich black soil" (*10*). This was the first report on the soils of the Bitterroot Valley. Though terse, it encompasses the range of soils that exist.

Lewis and Clark were followed by traders and trappers who came from the north to barter with the Flathead Indians.

The first white settlement was made in 1841 when Father DeSmet, a Jesuit priest, established St. Mary's Mission near the present site of Stevensville. Father Ravalli, for whom the county was named, assumed leadership in 1845. In 1850, because of various difficulties, the Mission was sold to Maj. John Owen, who converted it into a trading post. Encouraged by his success, other settlers arrived during the ensuing years. In 1877 Chief Joseph and a band of rebellious Nez Perce Indians passed through the valley, but they did no harm.

The Bitterroot Valley Area was first a part of the Oregon Territory, which was created in 1848. In 1859 it was transferred to the Washington Territory. It became part of the Idaho Territory in 1863 and part of the Montana Territory in 1864. When Montana became a State in 1889, Missoula County comprised all of Montana west of the Continental Divide. Ravalli County, which includes nearly all of the survey Area, was separated from Missoula County in 1893.

After the Northern Pacific Railroad was completed through Missoula in 1883 and the Bitterroot Branch was constructed to Darby in 1888, the population increased rapidly. The apple-orchard boom[4] of 1900 to 1915 brought a still larger influx of settlers (*4*, *5*).

According to the United States census, the precincts from which Ravalli County was later organized had a population of 2,613 in 1890. By 1900 the population had increased to 7,822, and by 1910, to 11,666. In 1930 the population had decreased to 10,315, but by 1940 it had increased again to 12,978. In 1950 it was 13,101, of which 10,423 were classed as rural. In 1950 Hamilton had a population of 2,678, Stevensville, 772, and Darby, 415. Most of the inhabitants live in the main valley.

Farm, Home, and Community Improvements

High schools, consolidated grade schools, and various churches are located in Darby, Hamilton, Corvallis, Victor, Stevensville, and Florence.

Transportation facilities are good. The Bitterroot Branch of the Northern Pacific Railroad extends from Missoula to Darby. U. S. Highway 93 traverses the length of the Area. To the north, it connects the valley directly with Missoula, an important shipping and marketing center. To the south, Highway 93 continues across the mountains by Lost Trail Pass to Salmon, Idaho. This highway and numerous county roads are hard surfaced. Many roads and trails are maintained throughout the Bitterroot National Forest. In the Selway-Bitterroot Wilderness Area, only trails are permitted.

Telephones and electricity are available to nearly every farm. In 1954, 1,008 of an estimated total of 1,391 farms had telephones, and 1,348 had electricity.

Farms were fairly well mechanized in 1954. The agricultural census of that year showed 1,232 motortrucks, 1,680 tractors, and 1,354 automobiles on the 1,391 farms.

Industry

Small sawmills have been common in the Bitterroot Valley since Father Ravalli built the first one in 1845. Large-scale exploitation of the forests began in the middle 1880's. The largest mill ever operated in the valley was built by Marcus Daly about 1890 and was operated until 1924. It supplied mine timbers to the Anaconda Copper Company's mines at Butte. After 1924, logs from the holdings of the Anaconda Copper Company and the Northern Pacific Railroad were shipped to the sawmill at Bonner. The logging of these lands was completed in 1950. The sawmills still operating get logs from small private holdings and from the Bitterroot National Forest.

Mining for gold, silver, lead, copper, and zinc has been conducted intermittently on a small scale since the 1850's. The principal mining areas are Hughes Creek, the upper part of the West Fork of the Bitterroot River, Eightmile Creek, and Kootenai Creek west of Victor. Fluorspar and vermiculite are mined in the Sapphire Mountains.

Plants for processing dairy products are located at Stevensville, Corvallis, Hamilton, and Grantsdale. Canneries are operated at Stevensville and Hamilton.

A large research laboratory of the United States Public Health Service is located at Hamilton.

Tourist and resort accommodations are an important part of the economy of the valley. Trout streams and big-game herds are abundant in the nearby mountains.

Agriculture

Most of the agriculture of the Bitterroot Valley Area depends upon livestock. All the main types of livestock do well. The major crops are the grasses and legumes that are required to support the livestock. More farmland is pastured than is used for any other purpose. Without irrigation, practically none of the soils in the Area are suitable for intensive cultivation.

The best agricultural soils are those on the gently sloping fan-terraces and the gently sloping to rolling benches on the east side of the Bitterroot River. These soils are fertile and are very productive if they are irrigated. On the west side of the valley, the soils are less well suited to agriculture.

[4] CAPPIOUS, S. L. A HISTORY OF THE BITTERROOT VALLEY TO 1914. Typewritten thesis. Univ. of Wash., Seattle, 1939.

Crops produced under irrigation include sugar beets, small grains, potatoes, peas, beans, other vegetables, sour cherries, hardy apples, and small fruits and alfalfa, clovers, and other pasture and hay plants. Not all soils are suited to all of these crops. Land that cannot be irrigated is used for range and, to a relatively small extent, for dryland farming. The dryland areas are suited to wheat, range, or forest.

History of Agriculture

Father DeSmet was the first farmer in Montana. In 1842 a small area near St. Mary's Mission was cultivated under his direction. Oats, wheat, and potatoes were planted. In the same year, Father DeSmet brought cattle from Ft. Colville on the Columbia River. A profitable trade in cattle and farm crops was built up between the residents of the Bitterroot Valley and emigrants traveling westward on Mullan's Road.

The first real ranch in Montana was established by Maj. John Owen, who purchased St. Mary's Mission in 1850. He and other traders supplied horses to the emigrants going farther west. The lean, sore-footed cattle that they took in exchange were fattened on native grass in the Bitterroot Valley. Later, mining developments nearby created a strong demand for agricultural products. Prices were high, but farmers paid high prices for their necessities. The principal crops of the early settlers were livestock, hay, grain, and vegetables.

An early large-scale ranching operation was begun by Marcus Daly in 1890. At one time he had 20,000 acres under cultivation. He raised hay, grain, and fruit. Horse-breeding was his principal enterprise[5] (*5, 4*).

The orchard boom

The first successful apple orchard in the Bitterroot Valley Area was started in 1868. By 1890, there were probably 6,000 bearing apple trees in the Bitterroot Valley. Fruit trees are reported to have been damaged by cold weather only once between 1870 and 1900. In 1900, more than 300,000 bearing apple trees were reported for Ravalli County. By 1913, nearly the entire area of the east-side and west-side benches was planted to apples. The McIntosh was the most popular variety. Pears, sour cherries, and other fruits were also planted. The number of orchards declined rapidly after 1913. In 1950 there were less than 45,000 bearing apple trees in Ravalli County, as compared to more than 720,000 trees in 1920. Unfavorable market conditions and many years of adverse weather contributed to the decline.

Dryland farming

The only dryland farming in the survey Area is done on the uplands high on the east side above Corvallis and Stevensville and on the hilly lands between Sula Basin and French Basin in the southern end of the Area. These lands were settled about the time of World War I. The smoother parts were plowed and cultivated to various crops, but many fields were soon abandoned or reseeded to perennial grasses. Many settlers later moved away, and there are few permanent homes in the dryland district. Residents of the valley now use the land chiefly for range. Limited areas are used to produce wheat and other small grains under a system of alternate crop and fallow.

[5] See footnote 4, page 6.

Irrigation

Irrigation is essential to agriculture in the Bitterroot Valley Area because the normal annual rainfall does not provide enough water for cultivated crops. The development of irrigation systems began in the early days of settlement.

History of irrigation systems

The first lands to be irrigated were the flood plains and low terraces next to the perennial streams. The early irrigation systems were simple. Many ranches had separate ditches running directly from the streams. Larger developments that supplied water to several farms were later undertaken. Even these did not need elaborate engineering. One of the earliest was the Surprise Ditch, completed in 1875 and now operated by the Corvallis Canal and Water Company. It diverts water from the Bitterroot River near Hamilton to the area around Corvallis.

By 1900 most of the valley was irrigated, except the high east-side benches and the more elevated parts of the high west-side benches. The system that supplies water to these lands was developed during the fruit-farm promotions early in the century. The largest project was the Big Ditch, now operated by the Bitterroot Irrigation District. In this system, water is stored in Lake Como on Rock Creek, and is then diverted, along with water from Lost Horse Creek, through a siphon over the Bitterroot River and through a canal more than 70 miles long to the high benches on the east side of the valley.

The early land and irrigation companies went bankrupt. The various irrigation systems in the Bitterroot Valley today are operated as private ditches, as cooperative irrigation districts, or as projects of the Montana State Water Conservation Board. The costs of operation and the adequacy of the water supply vary from one system to another. Water rights in Montana depend upon prior usage; consequently, the date a water right was established, in relation to other rights on the same source, is important in determining its value (*2*).

Irrigation water supply

Water for irrigation is obtained from the Bitterroot River and the perennial creeks. Most of it is diverted directly from the source, but some is first stored in reservoirs.

Stream flow is normally highest late in spring and early in summer, and lowest during midwinter. Ordinarily the peak is reached in June or late in May. Even in the driest years, there is usually enough water for everyone during the spring. Floods, if any, occur at this time. They are usually of short duration, but stream flow remains relatively high until late in June or July, and then diminishes rapidly.

Users of water from the Bitterroot River generally have ample water for full-season irrigation, even in the driest years. However, some of the smaller ditches lack adequate headgates, and it is difficult to divert water when the flow is low. Painted Rocks Lake, created by construction of the West Fork Dam 40 miles south of Darby, provides supplemental water for the Hedge and Republican Ditches. These are under the control of the Montana State Water Conservation Board. Painted Rocks Lake has a storage capacity of 31,706 acre-feet and a flooded area of 655 acres.

Water appropriations on the west-side creeks generally exceed the supply. Only those who hold the very earliest water rights get enough water for the full season. In average or dry years, those who have late appropriations are generally cut off by July 1st, and by July 15th or August 1st only the holders of the earliest two or three water rights on each creek are receiving water.

Storage reservoirs have been built on some of the creeks to provide late-season water to certain users. The largest reservoir of this type is Lake Como on Rock Creek. It is a natural glacial lake which has been increased in size. The storage capacity is 37,000 acre-feet. Water from Lake Como and some from Lost Horse Creek is siphoned across the Bitterroot River and carried by a canal about 72 miles long to irrigate the high benches on the east side. The system is owned and operated by the Bitterroot Valley Irrigation District. In most years, the supply of water is adequate. Several areas on the east side receive water from the east-side creeks by direct flow. The supply from these sources is likely to be inadequate.

Types of Farming

Farming in the Bitterroot Valley is widely diversified, but livestock raising is the predominant type of agriculture. Almost 90 percent of the commercial farms depend partly or entirely on income from livestock products. One-quarter of the farms in the valley are part-time or residential farms.

Numbers of the various types of farms were estimated by the United States Census Bureau from a sample taken in 1954. These figures are from data covering Ravalli County. The Bitterroot Valley Area as surveyed includes nearly all of the agricultural land in Ravalli County, but it also includes about 20 square miles in Missoula County. Most of the part of the survey Area that is in Missoula County is farmland on the flood plains, fans, and terraces in the main Bitterroot Valley. The following list shows the types of farms in Ravalli County, classified according to their major source of income.

	Number
Part-time and residential farms	351
Dairy farms	380
Livestock farms	315
General, primarily livestock, farms	36
Crop and livestock farms	83
General, primarily crop, farms	32
Field-crop farms	77
Fruit farms	45
Vegetable farms	10
Poultry farms	45

The remaining 17 farms in the county were not classified because their income depended on honey, fur farming, or other minor enterprises. The major sources of farm income on the part-time and residential farms were not classified because these sources normally did not reflect the actual agricultural possibilities of the farm unit.

Tables 2 and 3 show the numbers of livestock raised and the acreage of principal crops grown in Ravalli County during stated years.

TABLE 2.—*Number of livestock and beehives on farms in Ravalli County, Mont., in stated years*

Livestock	1930	1940	1950	1954
	Number	*Number*	*Number*	*Number*
Horses and mules	5,395	[1] 5,124	3,345	2,217
Cattle	25,294	[1] 25,194	32,912	49,916
Milk cows	7,767	9,414	8,895	9,196
Swine	9,520	[2] 6,843	6,804	5,017
Sheep	64,358	[3] 23,020	14,637	10,288
Chickens	[1] 54,283	[2] 65,219	[2] 59,808	[2] 77,458
Beehives	1,219	1,973	958	[4]

[1] Over 3 months old.
[2] Over 4 months old.
[3] Over 6 months old.
[4] Not reported.

TABLE 3.—*Acreage of principal crops and number of fruit trees of bearing age in Ravalli County, Mont., in stated years*

Crop	1929	1939	1949	1954
	Acres	*Acres*	*Acres*	*Acres*
Corn for all purposes	181	754	283	471
Harvested for grain	14	381	14	62
Wheat:				
Winter wheat (threshed)	2,543	1,029	1,648	3,646
Spring wheat (threshed)	5,291	4,977	6,898	4,872
Oats (threshed)	4,157	4,177	5,312	4,665
Barley (threshed)	3,692	4,250	7,137	7,060
Dry field and seed peas	1,454	1,572	497	1
All hay crops	42,412	47,128	42,104	44,195
Alfalfa	20,533	18,467	11,829	21,679
Clover and timothy, alone or mixed.	17,417	14,175	13,638	13,112
Small grains cut for hay	794	1,035	2,403	1,372
Wild hay	3,337	3,682	10,384	6,817
Other hay	331	9,769	3,850	1,215
Hay seed harvested:				
Alfalfa seed	35	282	64	113
Clover seed	6	250	91	99
Sugar beets for sugar	3,316	5,355	3,438	2,643
Irish potatoes	940	544	636	654
Vegetables harvested for sale.	759	806	687	134
Sweet corn	87	391	103	52
Green peas	364	213	468	--------
Tomatoes	8	24	12	10
Other vegetables	300	178	104	72
Strawberries	162	220	185	96
Other berries	31	98	81	77
Orchards	4,291	2,810	1,509	1,329
	Number	*Number*	*Number*	*Number*
Apple trees	242,174	154,602	44,636	35,290
Cherry trees	21,276	17,091	20,527	21,623
Plum and prune trees	903	849	954	1,726

Livestock farms

Livestock farms and general farms on which the main enterprise is the raising of livestock together total 351 in number, or 25 percent of the farms in the valley. On those classified as livestock farms, more than half of the income is obtained from the sale of livestock or livestock products other than dairy and poultry. On farms classified as general, but primarily livestock, the income from the sale of livestock or livestock products is less than 50 percent of the total farm income, and the income from them combined with the income from dairy products and poultry is more than 70 percent. The units in this group vary from irrigated farms to ranches. Ranches are units on which the grazing of livestock on native range is the main enterprise. Nearly all of the irrigated land on ranches is used to grow hay for winter feed.

Cattle are the principal livestock on the ranches in the upper valleys, including Sula Basin and French Basin. Headquarters and hay meadows for the ranches in this part of the Area are in the Gallatin association and the Mountainous lands association. Wet soils are left in wild hay and are seldom plowed. Better drained soils may be used for alfalfa or clover hays and may be plowed when reseeding is necessary. The small grains grown in preparation for reseeding meadows usually are cut for hay. Rangelands for these units are mostly in the Mountainous lands association and the Brownlee-Shook-Stecum association. Most ranchers have permits to graze part of their livestock in the national forest.

Several irrigated ranches are located on the west side of the main valley. The chief enterprise on these units is raising beef cattle for breeding stock. Many of the pastures are irrigated. Some are cutover or wooded lands. Most of the hay is grass or mixtures of grass and clover. Few of the soils on these ranches are well suited to alfalfa.

Both cattle and sheep are raised on ranch or ranch-farm units on the east side of the valley. Grazing is on both private lands and national forests. Sheep are sometimes transported outside the Area to graze for the summer. Rangelands for units in this part of the Area are in the Mountainous lands, Brownlee-Shook-Stecum, Skaggs-Cooney-Gird, and Skalkaho-Ravalli associations. A few of the ranches have their headquarters in these same associations. Crested wheatgrass and some alfalfa hay grown on dryland fields are the principal sources of winter feed on these ranches. Most of the units have their headquarters on irrigated farms. On many of these farms a number of crops are grown in regular rotations, but hay and grain for feed are the major crops. On many of the units, the cattle are fattened for market instead of being sold as feeders.

Irrigated farms that derive most of their income from livestock are located on both sides of the valley. Those on the east side are general farms on which are grown substantial acreages of cultivated crops. The livestock may include dairy cattle, beef cattle, and sheep or other livestock. On a few large farms in the Hamilton-Grantsdale-Corvallis association and the Burnt Fork-Riverside-Ravalli association, the livestock are mostly beef cattle.

On the west side of the valley, the general-livestock farms do not include so much cropland. On most of these farms, dairying is combined with beef production. Grass, mixed grass-and-clover hay, and pasture are the chief land uses. On tillable soils grains and some peas are grown in rotations, but these crops are less common here than on the east side.

Dairy farms

In 1954, 380 of the 1,040 commercial farms in Ravalli County were dairy farms. On these farms milk production is the primary enterprise, and more than half of the income is from sale of dairy products and cattle. All of the farms are irrigated or subirrigated.

Dairy farms in the various soil associations differ. Most of those in the Willoughby association, which consists mostly of soils underlain by hardpans, are 100-percent dairy units. The soils are used almost entirely for pasture and hay. Mixed grass-and-clover hays are most common. Small grains are grown only as part of preparation for reseeding meadows or pastures. No cash crops are grown.

Dairy farms in the Dominic-Corvallis-Gallatin association are similar to those in the Willoughby association, except that more alfalfa is grown for hay and some fields are used for rotation cropping.

Dairy farms on the Chamokane-Slocum association east of the Bitterroot River and on other soil associations on the east side of the valley are more like general farms. Many of the soils in these associations are suitable for various uses. Grain and cash crops are grown in rotations with hay and sometimes with seeded pastures. Many of the pastures, however, being on areas of cobbly, wet, or rough soils, are rarely plowed. Much of the hay is alfalfa or mixtures of alfalfa and grass. Native and mixed hay are grown to a considerable extent in the Chamokane-Slocum association.

Dairy farms on the west side of the Bitterroot River are principally pasture and hay units. The hay crops are chiefly grass or mixtures of grass and clover. Meadows are not reseeded very frequently in these areas. Some grain is grown, usually to prepare meadows for reseeding. Many of the pastures are wooded or cutover.

Poultry farms

On poultry farms, most of the income is from the sale of eggs and other poultry products. There were 45 such farms in Ravalli County in 1954, a little more than 3 per cent of the farms. Most of the poultry farms are small. They are not concentrated on any particular kind of soil. Most of the poultry feed is purchased rather than raised on the farm.

Crop-and-livestock farms

According to the 1954 census, 83 farms, or less than 6 percent of the farms, were crop-and-livestock farms. In this group, more than 30 percent and less than 70 percent of the farm income is from the sale of crops. Most of these farms are in the irrigated areas on the east side of the valley. The cash crops are likely to be sugar beets, peas, potatoes, fruits, or vegetables. These are grown in rotation with small grains and hays. Pastures are generally on the areas that are difficult to till.

Field-crop farms

There were 109 units classified as field-crop farms and primarily crop farms in Ravalli County in 1954, less than 8 percent of the total. Most of these are located on the east side. They include the dryland wheat farms and the irrigated farms on which sugar beets, potatoes, seed peas, grain, vegetables, or fruits are the principal sources of income.

The dryland wheat farms occur chiefly in the Skaggs-Cooney-Gird association. Most of the operators live in the valley. The crops are fall or spring wheat, barley, and oats grown in an alternate crop-and-fallow system. In general, only the deeper soils on slopes of less than 15 percent are cropped. The steeper soils will erode unless carefully managed.

Most of the irrigated field-crop farms are in the Hamilton-Grantsdale-Corvallis association, which is the association that contains the largest percentage of tillable soils. On some farms, sugar beets and potatoes are almost the only crops. Only enough legumes and grains are grown to maintain a reasonable rotation. On most farms, however, livestock is important.

Field crops are also grown for cash on other types of farms. The usual system is to grow the cash crops, grains, and legume-hays in rotation on the more easily tilled, more productive soils and to use the other parts of the farm for pasture or meadows of native hay. If there is not enough of the poorer land to meet pasture requirements, some of the easily tilled soils may be used for improved pastures. On most farms a well-balanced rotation of legumes, grains, and cash crops is followed.

Fruit and vegetable farms

Fruit farms and vegetable farms are scattered throughout the valley. Actually the number of farms on which fruit and vegetable production is important is considerably greater than the 55 farms, or less than 4 percent, reported at the time of the 1954 census. Farms were put in that classification only if more than half of the income was from the sale of fruit or vegetables.

The fruit farms include a few units which are primarily apple or sour-cherry orchards. These remnants of the once-extensive orchards in the Area occur on both sides of the valley and on various soils. Most of the fruit farms are probably berry farms. Dairying or other enterprises are also important on some of these farms.

The vegetable farms are mostly small specialized units located on the better east-side soils. Lettuce, carrots, cabbage, snapbeans, tomatoes, sweet corn, cucumbers, pumpkins, and other crops are grown.

Part-time and residential farms

Of the 1,391 farms in Ravalli County, 351, or 25 percent, are part-time or residential farms. These units of 5 to 20 acres or more are occupied by families who make most of their living from employment off the farm or who are retired. These acreages are usually clustered around the towns. The farms occur on various kinds of soil.

Vegetables, fruits, eggs, milk, and meat for home consumption are the chief products. Surpluses are sold through local markets. Truck and berry crops are produced for the commercial markets. Poultry, dairying, or meat production may be the principal enterprise. Some acreages are located on soils that have very little value for uses other than hay, pasture, or wood production. Most of the better part-time and residential farms are in the Hamilton-Corvallis-Grantsdale association, the Burnt Fork-Riverside-Ravalli association, and the Victor-Chereete association. In the last-named soil association, the productive farms are chiefly on the Victor soils.

Related to the part-time and residential farms are the country estates. They may be small or large. Some are merely country homes that are more sumptuous than the average; some are bona fide farms or ranches. They are improved and managed without economic restrictions.

Land Use and Farm Tenure

The size of farms in Ravalli County in 1954 ranged from less than 10 acres to more than 1,000 acres. About 37 percent of the farms were less than 50 acres in size, and about 39 percent were from 50 to 219 acres in size. The remaining 23 percent of the farms ranged in size from 220 to more than 1,000 acres.

Of the 1,396 farms in Ravalli County in 1954, 1,273 —more than 90 percent—were irrigated. Irrigated farms covered a total of 340,453 acres, but only 106,872 acres of this was actually irrigated. Of the 67,462 acres of cropland harvested in the county, 60,003 acres was irrigated. The remaining 46,869 acres of irrigated land was in pasture.

More farmland in Ravalli County is used for pasture than for any other purpose. A total of 250,828 acres was pastured in Ravalli County in 1954. Besides the irrigated pasture, 85,339 acres of woodland was pastured. Woodland on the farms but not pastured covered 4,431 acres. Idle land or summer fallow totalled 6,502 acres in 1954.

In Ravalli County, 90 percent of the farm operators were owners or part owners in 1954, and 9.9 percent were tenants. Only 10 farms were operated by managers.

The Soils of the Bitterroot Valley Area

The soils of the Bitterroot Valley Area differ widely in fertility, physical and chemical properties, and productivity. These differences are the result of local differences in the environments under which the soils have formed.

How the Soils are Formed

The important factors of the environment that influence the formation of soil are (1) parent material, (2) vegetation, (3) climate, (4) topography, or lay of the land, and (5) age, or length of time that the soils have weathered.

The formation of soils is a very slow process that consists of three overlapping steps. First of all, parent material accumulates, either by the breakdown of bedrock in place or by the deposition of material weathered from rock by water, wind, or ice. The Brownlee, Cooney, Skaggs, and Trapper soils, for example, have developed, at least partly, from various kinds of bedrock weathered in place. The Charlos, Lick, Riverside, Victor, and Hamilton soils have developed in material that was deposited by flooding streams. Some of the Woodside soils have developed in material deposited by glaciers. The Amsterdam, Gird, and Sula soils have developed in silt (loess) deposited by winds.

After the parent material has accumulated, or sometimes while it is accumulating, organic matter is added, first by simple forms of life such as bacteria and fungi, and then by trees, grasses, and other plants. The amount of organic matter and the depth at which it is deposited is determined by the kind of vegetation and the rate at which the climate causes it to decay. Thus the Charlos soils, developed in semiarid climates under grassland vegetation, have moderate amounts of organic matter in the surface soil. The Lick soils, developed in humid climates under dense coniferous forests, have surface mats of organic material over light-colored surface soils that contain very little organic matter. The Maiden soils, developed in semiarid climates under grass, have very dark grayish-brown surface soils moderately high in organic matter. The Skaggs soils, developed in subhumid climates under grass, have black surface soils high in organic matter. Vegetation and climate together affect the depth of leaching and the rate of weathering, and consequently determine the chemical nature or fertility of the soil. It is because of these influences that, other things being equal, grassland soils are more fertile than forest soils.

Plant life and animal life cause changes in the upper part of the parent material, and a soil profile starts to form. At first the soil may have only the surface soil, or A horizon, and the parent material, or C horizon. But as leaching occurs and weathering continues, a subsoil, or B horizon, begins to develop. This will differ in color, texture, structure, and other characteristics from the surface soil above it and from the parent material below. The longer the soil has been developing, the more distinct these differences are. Thus, *age* is important in soil formation and classification. Examples of young soils in the Bitterroot Valley Area are the Chamokane and the Kenspur. Although still relatively young in terms of soil formation, the Burnt Fork and Sula soils are mature enough to show the influence of climate and vegetation. The Charlos, Lick, and Ravalli soils are relatively old.

The Laporte and Stecum soils are immature in profile development because of steep slopes, not because they are young in terms of actual years. On steep slopes the top layers erode before distinct horizons can be developed. Topography also influences soil formation through its effect on drainage. The poorly drained Larry soils, for example, are quite different from the Victor soils, although they developed from similar materials. Peat soils develop as a result of poor drainage that encourages rank vegetative growth but retards decay of plant remains.

How the Soils are Classified

This section considers the classification of soils as natural bodies. Such a classification is made on the basis of the characteristics of the soil profile and the total environment in which the soil exists.

The broadest categories of soil classification are the three *orders*—zonal, intrazonal, and azonal. Zonal soils are those that strongly reflect the influence of vegetation and climate. Burnt Fork, Gird, Skaggs, and Lick are examples of zonal soils. Azonal soils are those which are so young or so steep or are developing on such resistant material that very little progress in soil formation has been made. Kenspur, Dominic, and Castner soils are examples. Intrazonal soils have distinct horizons, but their dominant characteristics are those that depend on age or the nature of the parent material rather than on vegetation or climate. The Ravalli and Larry soils are examples.

Within the soil orders are the *great soil groups*. A great soil group is made up of soils that have generally similar profiles resulting from the similarity of several, but not all, of the soil-forming factors. For example, all of the soils in one zonal great soil group have developed under the same type of vegetation, in the same kind of climate, and on similar topography, but they vary in age and were derived from different parent material. In the Bitterroot Valley Area are soils of the Brown, Chestnut, Chernozem, Gray Wooded, and Brown Podzolic great soil groups of the zonal order; of the Planosol, Bog, Humic Gley, and Low-Humic Gley group of the intrazonal order; and of the Alluvial, Regosol, and Lithosol groups of the azonal order.

The *soil series* are divisions within the great soil groups. All of the soils in one series are similar in all profile characteristics except texture of the surface soil. Within a series, soils of similar surface texture are classified as a *soil type*. Some special characteristics such as depth, slope, erosion, and drainage are recognized by subdividing soil types into *phases*. The word "variant" in a soil name means that the unit is part of a series not yet named.

The classification of the soil series mapped in the Bitterroot Valley Area, the significant characteristics of each series, and the soil-forming factors that influenced the development of each soil are shown in table 4. Each series is described in some detail in the section Soil Descriptions.

TABLE 4.—*Classification of soils and description of soil-forming factors*

ZONAL SOILS

Great soil group and series	Soil-forming factors				
	Vegetation	Climate	Topography	Parent material	Relative age[1]
Brown soils:					
Amsterdam	Grass	Arid	Well-drained level to steep benches.	Calcareous loess over Tertiary sediments.	Intermediate.
Bitterroot	Grass	Arid	Same	Calcareous Tertiary siltstones and sandstones.	Intermediate.
Burnt Fork	Grass	Arid	Same	Somewhat gravelly calcareous fine earth over permeable Tertiary sediments.	Intermediate.
Grantsdale	Grass	Arid	Well-drained level to gently sloping low fan-terraces.	Calcareous silty fine earth, moderately deep over gravel.	Young.
Greeley	Grass	Arid	Same	Sandy alluvium	Young.
Hamilton	Grass	Arid	Same	Calcareous silty fine earth, deep over gravel.	Young.
Lone Rock	Grass	Arid	Same	Fine gravelly granitic alluvium.	Young.
Riverside	Grass	Arid	Well-drained level to steep benches.	Gravels of mixed origin	Intermediate.
Wemple	Grass	Arid	Same	Calcareous Tertiary sediments of sand, silt, and volcanic ash.	Intermediate.
Willoughby	Grass	Arid	Well-drained level to sloping benches.	Somewhat gravelly calcareous fine earth, moderately deep over lime-cemented Tertiary sediments.	Intermediate.
Chestnut soils:					
Bass	Grass and open timber.	Semiarid	Well-drained level to steep early Pleistocene high benches.	Very strongly weathered cobbly and gravelly granitic outwash.	Old.
Blodgett	Same	Semiarid	Same	Strongly weathered cobbly and gravelly granitic outwash.	Intermediate.
Brownlee	Same	Semiarid	Well-drained sloping to steep uplands.	Granite very strongly weathered in place.	Very old.
Charlos	Same	Semiarid	Well-drained level to steep early Pleistocene high benches.	Very strongly weathered loamy granitic outwash.	Very old.
Cooney	Grass	Semiarid	Well-drained sloping to steep uplands.	Weathered pre-Cambrian sandstone and quartzite with calcareous loess.	Intermediate.
Duffy	Grass and open timber.	Semiarid	Same	Granite very strongly weathered in place, with admixtures of limy Tertiary sediments.	Very old.
Gird	Grass	Semiarid	Same	Calcareous loess, deep over pre-Cambrian sandstone and quartzite.	Intermediate.
Gird, high lime subsoil variant.	Grass	Semiarid	Same	Calcareous loess, deep over pre-Cambrian limestone.	Intermediate.
Gird, sandy subsoil variant.	Grass	Semiarid	Same	Calcareous sandy loess over weathered granite.	Intermediate.
Lolo	Grass	Semiarid	Well-drained level to gently sloping late Pleistocene low fan-terraces.	Loamy quartzite gravels	Young.
Maiden	Grass	Semiarid	Well-drained sloping to steep uplands.	Weathered pre-Cambrian limestone with loess admixture.	Intermediate.
Shook	Grass and open timber.	Semiarid	Same	Granite strongly weathered in place.	Young.
Skalkaho	Grass	Semiarid	Well-drained gently sloping to steep Pleistocene and Tertiary high benches.	Loamy quartzite gravels	Young.
Skalkaho, micaceous variant.	Grass	Semiarid	Same	Loamy micaceous and quartzite gravels.	Young.

See footnote at end of table.

TABLE 4.—*Classification of soils and description of soil-forming factors*—Continued

ZONAL SOILS—Continued

Great soil group and series	Soil-forming factors				
	Vegetation	Climate	Topography	Parent material	Relative age[1]
Sula	Grass and open timber.	Semiarid	Well-drained level to steep early Pleistocene high benches.	Loess over strongly weathered loamy granitic outwash.	Intermediate.
Victor	Grass and open timber.	Semiarid	Well-drained level to gently sloping late Pleistocene low fan-terraces.	Loamy fine earth, shallow to moderately deep over unweathered gravelly and cobbly granitic outwash.	Young.
Chernozems:					
Adel	Grass	Subhumid	Well-drained local colluvial-alluvial slopes and low fan-terraces.	Loamy fine earth washed from weathered sedimentary rock.	Young.
Breece	Grass	Subhumid	Same	Sandy and fine gravelly fine earth washed from weathered granite.	Young.
Skaggs	Grass	Subhumid	Well-drained strongly sloping to steep uplands.	Weathered pre-Cambrian limestone with loess admixture.	Intermediate.
Teton	Grass	Subhumid	Same	Weathered pre-Cambrian sandstone with calcareous loess admixture.	Intermediate.
Gray Wooded soils:					
Chereete	Forest	Humid	Well-drained level to sloping late Pleistocene fans and terraces.	Unweathered gravelly and cobbly granitic outwash.	Young.
Clark Fork	Forest	Humid	Same	Same	Young.
Como	Forest	Humid	Well-drained level to steep early Pleistocene high benches and moraines.	Weathered gravelly and cobbly granitic outwash.	Intermediate.
Gorus	Forest	Humid	Same	Loess over strongly weathered loamy granitic outwash and till.	Intermediate.
Lick	Forest	Humid	Same	Very strongly weathered loamy granitic outwash and till.	Old.
Trapper	Forest	Humid	Well-drained strongly sloping to steep uplands.	Weathered pre-Cambrian limestone.	Intermediate.
Woodrock	Forest	Humid	Same	Weathered granite	Intermediate.
Woodside	Forest	Humid	Well-drained level to steep early Pleistocene high benches and moraines.	Weathered gravelly and cobbly granitic outwash.	Intermediate.
Brown Podzolic soils:					
Holloway	Forest	Humid	Well-drained strongly sloping to steep uplands.	Weathered pre-Cambrian quartzite and sandstone.	Young.
INTRAZONAL SOILS					
Planosols:					
Haccke	Grass	Arid to semiarid.	Well-drained level to strongly sloping benches and uplands.	Stone-free silty to loamy materials.	Very old.
Ravalli	Grass	Same	Same	Gritty to stony loamy materials.	Very old.
Bog soils:					
Peat	Rushes, sedges, grass, and shrubs.	Semiarid to humid.	Poorly drained depressions and swales.	Organic material	Young.
Humic Gley soils:					
Corvallis, poorly drained variant.	Sedges, grass, and shrubs.	Arid to semiarid.	Poorly drained flood plains and fans.	Calcareous silty alluvium	Young.

See footnote at end of table.

TABLE 4.—*Classification of soils and description of soil-forming factors*—Continued

INTRAZONAL SOILS—Continued

Great soil group and series	Soil-forming factors				
	Vegetation	Climate	Topography	Parent material	Relative age[1]
Gallatin	Same	Semiarid to subhumid.	Imperfectly drained to poorly drained flood plains and fans.	Calcareous loamy to clayey alluvium.	Young.
Larry	Same	Same	Imperfectly drained to poorly drained swales and fans.	Loamy to clayey alluvium, moderately deep over granitic gravel.	Young.
Slocum, poorly drained variant.	Same	Arid to semiarid.	Poorly drained flood plains and fans.	Loamy alluvium, moderately deep over gravel.	Young.
St. Joe	Same	Semiarid to subhumid.	Imperfectly drained to poorly drained swales and fans.	Loamy to clayey alluvium, moderately shallow over granitic gravel.	Young.
Low-Humic Gley soils:					
Lick, imperfectly drained variant.	Forest	Humid	Imperfectly drained to poorly drained fan-terraces.	Strongly weathered loamy granitic outwash.	Old.
Poverty	Forest	Humid	Same	Unweathered and partly weathered gravelly granitic outwash.	Young.

AZONAL SOILS

Great soil group and series	Vegetation	Climate	Topography	Parent material	Relative age[1]
Alluvial soils:					
Chamokane	Grass and open timber.	Arid to semiarid.	Well-drained flood plains.	Sandy and loamy alluvium, shallow and moderately deep over gravel.	Very young.
Corvallis	Grass	Same	Moderately well drained low fans and terraces.	Calcareous silty alluvium, deep and moderately deep over gravel.	Very young.
Kenspur	Grass and open timber.	Same	Well-drained flood plains.	Sandy and loamy alluvium, deep over gravel.	Very young.
Slocum	Same	Same	Moderately well drained flood plains.	Sandy and loamy alluvium, moderately deep and deep over gravel.	Very young.
Regosols:					
Dominic	Grass	Arid	Excessively drained level to gently sloping low fan-terraces.	Quartzite and argillite gravels and cobblestones.	Very young.
Lithosols:					
Castner	Grass	Arid to semiarid.	Somewhat excessively drained strongly sloping to steep uplands.	Pre-Cambrian sandstone and quartzite.	Very young.
Cheadle	Grass	Subhumid	Same	Pre-Cambrian sandstone and quartzite.	Very young.
Laporte	Grass	Arid to semiarid.	Same	Pre-Cambrian limestone	Very young.
Sogn	Grass	Subhumid	Same	Pre-Cambrian limestone	Very young.
Stecum	Grass and open timber.	Arid to subhumid.	Same	Granite	Very young.

[1] In terms of amount of weathering and degree of profile development.

Laboratory Data

Table 5 gives the mechanical analysis, reaction (pH), and organic carbon content of samples of certain soils of the Bitterroot Valley Area. Table 6 gives the cation exchange capacity, the exchangeable sodium, the conductivity of the saturation extract, and the calcium carbonate content of a few soils.

Most of the soils analyzed are of loam or coarser texture. Only the Bass, Charlos, Lick, Ravalli, and Haccke soils have appreciable amounts of clay in the B horizons. The Ravalli and Haccke are columnar claypan soils developed in Tertiary sediments and loess. The Bass, Charlos, and Lick soils have developed in strongly weathered granitic outwash. The Sula and Gorus show a marked increase in clay content in the buried B horizons of former soils that underlie them. Except in Larry clay loam, a Humic Gley soil, the amounts of organic carbon are relatively small. Corvallis silt loam, moderately saline, is a saline-alkali soil.

TABLE 5.—*Mechanical analyses of selected soils*

[Analyses were by pipette method, using hydrogen peroxide to destroy organic matter and sodium hexametaphosphate plus sodium carbonate as dispersing agent. Data are expressed in percentages on oven-dry basis. These data were compiled under supervision of L. T. Alexander, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture]

Soil name, location, and sample number	Horizon	Depth	pH [1]	Organic carbon content [2]	Size class and diameter of particles: Gravel [3] (more than 2 mm.)	Very coarse sand (2–1 mm.)	Coarse sand (1–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.1 mm.)	Very fine sand (0.1–0.05 mm.)	Silt (0.05–0.002 mm.)	Clay (less than 0.002 mm.)
		Inches		*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Amsterdam silt loam (Sec. 15, T. 7 N., R. 20 W., SE¼NW¼):												
51-Mont-41-14-1	A_p	0–10	7.1	0.54	<1	1.0	1.7	1.8	9.6	23.4	45.4	17.1
51-Mont-41-14-2	B_2	10–16	7.3	.15	<1	1.5	1.5	1.7	10.0	24.6	45.2	15.5
51-Mont-41-14-3	C_{ca}	16–32	8.1	.03	0	.2	.4	.6	4.4	19.2	64.1	11.1
51-Mont-41-14-4	C_2	32–45	8.1	.02	0	.1	.2	.5	5.8	36.7	50.5	6.2
51-Mont-41-14-5	C_3	45–55	8.1	.02	0	.1	.3	.6	5.8	25.0	61.4	.8
Bass coarse sandy loam (Sec. 6, T. 8 N., R. 20 W., SE¼SW¼):												
51-Mont-41-21-1	A_1	0–7	6.4	.24	11	12.4	20.4	12.0	18.8	9.1	18.9	8.4
51-Mont-41-21-2	B_2	7–15	6.1	.14	14	11.4	19.4	11.7	19.3	9.3	18.3	10.6
51-Mont-41-21-3	B_3	15–28	6.0	.11	10	13.0	21.3	10.4	15.7	7.7	16.1	15.8
51-Mont-41-21-4	C	28–42	6.5	.08	21	16.0	24.3	11.7	17.4	7.6	13.7	9.3
Blodgett coarse sandy loam (Sec. 26, T. 7 N., R. 21 W., NW¼SW¼ SE¼):												
51-Mont-41-3-1	A_1	0–8	5.7	.98	9	14.1	23.1	11.3	15.0	7.9	19.1	9.5
51-Mont-41-3-2	B_2	8–14	5.6	.51	16	25.6	23.1	9.2	12.6	6.5	15.4	7.6
51-Mont-41-3-3	B_3	14–24	6.4	.02	50	15.4	23.9	12.8	21.5	10.2	11.8	4.4
51-Mont-41-3-4	C	24–32	6.2	.05	35	16.8	23.3	12.6	21.7	10.1	11.2	4.3
Breece loamy coarse sand (Sec. 30, T. 5 N., R. 20 W., NW¼SE¼):												
51-Mont-41-35-1	A_p	0–7	6.5	1.69	17	20.7	23.6	11.2	16.3	7.6	15.0	5.6
51-Mont-41-35-2	A_{12}	7–21	6.6	.79	26	22.7	25.7	11.7	17.0	7.1	10.9	4.9
51-Mont-41-35-3	B	21–42	6.5	.35	22	25.9	20.8	9.6	16.5	8.2	14.1	4.9
51-Mont-41-35-4	C	42–66	6.2	.32	23	14.6	19.5	11.5	20.7	11.1	16.9	5.7
Brownlee loam (Sec. 19, T. 10 N., R. 18 W., NE¼):												
51-Mont-41-57-1	A_1	0–7	5.9	2.90	15	13.2	11.9	5.2	8.4	7.3	36.4	17.6
51-Mont-41-57-2	B_{21}	7–14	6.4	.61	24	14.5	15.2	6.4	10.8	8.4	28.5	16.2
51-Mont-41-57-3	B_{22}	14–26	6.6	.24	33	18.1	22.8	9.3	15.4	6.6	11.8	16.0
51-Mont-41-57-4	C	26–42	6.6	.19	26	23.4	24.3	9.4	14.6	6.4	11.9	10.0
Burnt Fork loam (Sec. 23, T. 7 N., R. 20 W., 75 ft. SE of NW corner of SE¼SW¼):												
51-Mont-41-6-1	A_p	0–8	6.8	1.18	11	6.3	7.9	5.3	12.2	19.0	35.1	14.2
51-Mont-41-6-2	B_2	8–15	7.1	.49	58	7.9	9.4	6.3	12.5	17.6	30.6	15.7
51-Mont-41-6-3	C_{ca}	15–24	8.1	.38	39	9.9	9.5	6.4	14.4	18.8	26.1	14.9
51-Mont-41-6-4	C	24–36	8.1	.30	69	13.7	11.9	7.0	16.8	21.4	21.8	7.4
Charlos silt loam (Sec. 3, T. 3 N., R. 21 W., NW¼SW¼):												
51-Mont-41-23-1	A_p	0–8	6.0	.32	<1	7.2	7.9	4.1	6.7	8.8	47.2	18.1
51-Mont-41-23-2	B_{21}	8–11	5.9	.20	6	6.5	8.4	4.4	7.3	9.0	43.1	21.3
51-Mont-41-23-3	B_{22}	11–20	6.2	.13	6	7.4	9.7	5.2	9.5	9.5	32.9	25.8
51-Mont-41-23-4	B_3	20–30	6.1	.10	6	8.0	9.0	4.4	7.7	9.4	37.5	24.0
51-Mont-41-23-5	C	30–45	6.6	.07	7	7.4	7.2	3.8	7.1	9.6	44.7	20.2
Chereete gravelly coarse sandy loam (Sec. 11, T. 10 N., R. 20 W., SW¼NW¼):												
51-Mont-41-33-2	A_2	0–3	5.6	2.28	40	13.0	20.0	11.2	14.6	6.5	23.9	10.8
51-Mont-41-33-3	AC	3–14	6.1	.58	55	10.5	20.2	12.9	17.6	7.0	22.0	9.8
51-Mont-41-33-4	C	14–30	6.1	.62	62	11.7	24.5	17.5	25.4	6.2	8.7	6.0
Corvallis silt loam, moderately saline (Sec. 28, T. 8 N., R. 20 W., SW¼-SW¼):												
51-Mont-41-48-1	A_p	0–8	9.8	.52	<1	.3	2.8	4.7	8.3	8.5	59.7	15.9
51-Mont-41-48-2	B	8–14	9.6	.20	0	.2	.9	1.9	3.3	4.8	69.1	19.8
51-Mont-41-48-3	C_1	14–20	9.5	0	0	0	.4	1.3	2.5	3.2	72.2	20.4
51-Mont-41-48-4	C_2	20–30	9.3	0	0	.1	.7	2.5	8.6	7.5	63.9	16.7
51-Mont-41-48-5	C_3	30–52	8.5	0	0	.2	11.6	39.5	35.8	5.5	5.5	1.9
Gird silt loam (Sec. 20, T. 8 N., R. 19 W., NE¼SE¼):												
51-Mont-41-16-1	A_1	0–9	6.4	1.67	0	.3	.5	.8	3.3	15.6	64.5	15.0
51-Mont-41-16-2	B_{21}	9–14	6.7	.43	0	.1	.3	.5	2.4	18.1	63.4	15.2
51-Mont-41-16-3	B_{22}	14–27	7.0	.08	0	.1	.4	.6	2.9	19.2	61.3	15.5

See footnotes at end of table.

TABLE 5.—*Mechanical analyses of selected soils*—Continued

Soil name, location, and sample number	Horizon	Depth	pH [1]	Organic carbon content [2]	Size class and diameter of particles							
					Gravel [3] (more than 2 mm.)	Very coarse sand (2–1 mm.)	Coarse sand (1–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.1 mm.)	Very fine sand (0.1–0.05 mm.)	Silt (0.05–0.002 mm.)	Clay (less than 0.002 mm.)
		Inches		*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Gird silt loam (Sec. 20, T. 8 N., R. 19 W., NE¼SE¼)—Continued:												
51-Mont-41-16-4	B_3	27–40	7.3	.07	0	.1	.4	.7	3.9	21.1	58.9	14.9
51-Mont-41-16-5	C_{ca}	40–54	8.2	.08	0	.2	.6	.8	4.4	20.8	63.7	9.5
51-Mont-41-16-6	C	54–66	8.3	.12	<1	.4	.6	.8	4.7	23.1	55.4	15.0
Gird silt loam, high lime subsoil variant (Sec. 30, T. 7 N., R. 19 W., SE¼NE¼):												
51-Mont-41-18-1	A_p	0–7	7.1	.86	0	.8	1.9	1.9	6.6	18.2	56.9	13.7
51-Mont-41-18-2	B_{21}	7–12	7.2	.88	0	1.3	2.3	1.9	6.5	18.2	56.6	13.2
51-Mont-41-18-3	B_{22}	12–21	7.7	.39	<1	1.3	1.9	1.7	6.1	19.0	55.3	14.7
51-Mont-41-18-4	C_1	21–32	8.4	.19	<1	1.8	2.5	2.2	8.5	19.2	48.0	17.8
51-Mont-41-18-5	C_2	32–45	8.6	.20	<1	2.7	4.6	3.8	12.7	22.5	39.0	14.7
51-Mont-41-18-6	C_3	45–54	9.0	.11	19	6.6	10.6	7.4	22.3	30.0	18.1	5.0
Gorus silt loam (Sec. 11, T. 2 N., R. 21 W., SW¼NE¼):												
51-Mont-41-39-2	A_2	0–5	6.4	.71	5	4.2	4.1	2.2	5.8	10.2	57.5	16.0
51-Mont-41-39-3	B_1	5–10	6.1	.25	4	3.9	3.6	2.0	5.2	9.9	66.4	9.0
51-Mont-41-39-4	B_2	10–22	6.1	0	<1	2.7	3.0	1.7	4.9	9.7	54.9	23.1
51-Mont-41-39-5	B_{2b}	22–36	7.2	.08	<1	7.0	7.2	4.2	8.2	10.6	35.9	27.1
51-Mont-41-39-6	B_{3b}	36–48	7.2	.05	21	14.2	10.8	5.9	11.5	9.3	24.3	24.0
Grantsdale loam, shallow (Sec. 22, T. 8 N., R. 20 W., NW¼SW¼):												
51-Mont-41-32-1	A_p	0–7	7.6	2.60	5	2.8	9.9	8.1	15.0	11.4	39.5	13.3
51-Mont-41-32-2	B_2	7–10	7.7	1.36	<1	3.0	9.6	8.0	16.7	13.8	37.7	11.2
51-Mont-41-32-3	B_{3ca}	10–15	7.8	.99	<1	2.0	7.4	6.3	17.8	19.0	38.7	8.8
51-Mont-41-32-4	C_{ca}	15–24	7.6	.77	84	5.8	18.3	15.6	20.2	9.6	21.5	9.0
51-Mont-41-32-5	D	24–42	7.6	.30	81	24.9	32.9	22.6	12.4	1.8	2.7	2.7
Haccke silt loam (Sec. 21, T. 8 N., R. 19 W., SW¼SW¼):												
51-Mont-41-17-1	A_1	0–6	6.6	.83	0	.3	.6	.7	3.4	17.4	66.2	11.4
51-Mont-41-17-2	B_{21}	6–10	8.0	.17	0	.1	.3	.5	3.0	16.1	58.1	21.9
51-Mont-41-17-3	B_{22}	10–14	8.7	.20	0	.1	.3	.6	3.2	18.2	60.3	17.3
51-Mont-41-17-4	B_{3ca}	14–20	8.6	.09	<1	.2	.5	.8	3.9	21.9	59.9	12.8
51-Mont-41-17-5	B_{3ca}	20–30	8.3	.06	<1	.2	.9	1.1	5.0	23.3	55.6	13.9
51-Mont-41-17-6	C_1	30–42	9.0	.12	3	.5	1.0	1.4	6.8	23.9	52.8	13.6
51-Mont-41-17-7	C_2	42–56	8.8	.40	6	1.4	1.2	1.4	12.0	26.2	46.1	11.7
Hamilton silt loam (Sec. 15, T. 8 N., R. 20 W., NE¼NW¼):												
51-Mont-41-10-1	A_p	0–9	7.8	1.36	0	.4	.7	.7	1.8	5.8	71.6	19.0
51-Mont-41-10-2	B	9–14	7.7	.52	0	.1	.5	.3	.9	5.9	76.3	16.0
51-Mont-41-10-3	C_{ca}	14–22	8.0	.47	0	.1	.5	.3	.9	4.3	82.7	11.2
51-Mont-41-10-4	C_2	22–30	7.9	.22	0	.2	.3	.3	1.2	6.0	84.2	7.8
51-Mont-41-10-5	C_3	30–40	7.9	.32	0	1.0	3.2	3.1	4.2	4.3	69.0	15.2
51-Mont-41-10-6	C_4	40–48	8.0	.46	11	1.8	7.3	7.7	11.4	12.7	44.6	14.5
Kenspur fine sandy loam (Sec. 36, T. 11 N., R. 20 W., SE¼SW¼):												
51-Mont-41-34-1	A_p	0–7	7.0	2.31	0	.1	.9	5.6	30.0	16.9	36.5	10.0
51-Mont-41-34-2	B	7–13	7.6	.97	0	.1	.7	5.5	25.0	12.3	43.6	12.8
51-Mont-41-34-3	C_1	13–30	9.0	.58	0	.2	.8	7.1	37.5	19.0	27.6	7.8
51-Mont-41-34-4	C_2	30–36	8.2	.46	0	.1	1.1	2.1	13.1	12.2	57.0	14.4
51-Mont-41-34-5	C_3	36–50	7.0	.19	0	.3	2.0	3.1	38.8	30.2	21.4	4.2
51-Mont-41-34-6	C_4	50–60	7.0	.15	0	.4	5.9	14.7	48.1	15.8	12.6	2.5
Larry clay loam (Sec. 33, T. 10 N., R. 20 W., NE¼NE¼):												
51-Mont-41-43-1	A_p	0–5	6.0	9.3	<1	4.9	8.9	5.0	8.3	4.8	31.7	36.4
51-Mont-41-43-2	A_{12}	5–11	6.2	3.84	<1	4.2	7.2	4.6	7.9	5.5	34.2	36.4
51-Mont-41-43-3	B_g	11–23	6.4	.22	11	7.3	11.6	6.7	14.8	9.3	28.9	21.4
51-Mont-41-43-4	C_g	23–36	6.8	0	36	14.7	21.7	10.8	19.5	8.5	16.6	8.2
Lick loam (Sec. 12, T 2 N., R. 21 W., NW¼SW¼):												
51-Mont-41-24-2	A_1	0–1	5.6	2.55	10	9.1	9.7	3.6	9.5	9.3	51.1	7.7
51-Mont-41-24-3	A_2	1–8	6.6	.15	13	7.6	7.6	3.7	6.7	9.0	57.8	7.6
51-Mont-41-24-4	B_1	8–15	6.5	.12	12	6.1	6.4	3.4	6.4	8.8	55.4	13.5
51-Mont-41-24-5	B_2	15–21	6.2	.09	20	7.1	6.7	3.8	7.7	8.4	46.0	20.3
51-Mont-41-24-6	B_3	21–34	6.2	.08	15	7.0	6.9	3.8	7.9	9.6	47.5	17.3

See footnotes at end of table.

TABLE 5.—*Mechanical analyses of selected soils*—Continued

Soil name, location, and sample number	Horizon	Depth	pH [1]	Organic carbon content [2]	Size class and diameter of particles							
					Gravel [3] (more than 2 mm.)	Very coarse sand (2–1 mm.)	Coarse sand (1–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.1 mm.)	Very fine sand (0.1–0.05 mm.)	Silt (0.05–0.002 mm.)	Clay (less than 0.002 mm.)
		Inches		*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Ravalli loam (Sec. 22, T. 6 N., R. 20 W., 470 feet N. of the SE corner of NE¼):												
51–Mont–41–4–1	A_p	0–7	7.2	2.21	5	8.1	10.2	7.0	11.6	9.6	38.6	14.9
51–Mont–41–4–2	B_2	7–13	7.8	.37	12	6.4	9.1	8.3	12.4	9.9	26.0	27.9
51–Mont–41–4–3	B_{3ca}	13–26	9.0	.19	10	7.1	7.7	5.6	14.6	16.7	31.4	16.9
51–Mont–41–4–4	C	26–36	8.3	.08	23	11.2	10.5	6.8	16.8	21.6	27.2	5.9
Shook coarse sandy loam (Sec. 19, T. 10 N., R. 19 W., SW¼SW¼):												
51–Mont–41–26–1	A	0–11	6.4	.24	16	24.9	20.4	7.5	12.2	5.9	17.6	11.5
51–Mont–41–26–2	B_{21}	11–18	6.6	.13	16	20.5	19.6	7.9	13.5	7.2	19.4	11.9
51–Mont–41–26–3	B_{22}	18–30	6.8	.09	27	19.6	23.4	9.0	15.4	6.6	14.9	11.1
51–Mont–41–26–4	B_3	30–40	6.6	.07	30	18.8	22.6	8.7	16.1	7.7	15.5	10.6
Slocum loam (Sec. 32, T. 8 N., R. 20 W., NE¼NE¼):												
51–Mont–41–19–1	A_p	0–7	5.9	3.95	0	.3	2.7	4.7	13.1	13.3	48.5	17.4
51–Mont–41–19–2	B_g	7–12	6.2	.78	<1	.3	4.2	11.0	27.8	15.6	31.0	10.1
51–Mont–41–19–3	C_g	12–22	6.5	.46	0	.4	5.1	12.4	37.5	17.9	20.6	6.1
51–Mont–41–19–4	D	22–30	7.6	.20	74	9.3	49.9	17.0	14.1	4.3	3.8	1.6
Sula loam variant (Sec. 16, T. 2 N., R. 19 W., SW¼):												
51–Mont–41–29–1	A_{11}	0–5	7.2	2.43	<1	7.1	7.1	3.4	6.6	9.2	46.0	20.6
51–Mont–41–29–2	A_{12}	5–11	7.0	1.05	<1	7.1	7.2	3.5	7.0	10.9	45.5	18.8
51–Mont–41–29–3	B_2	11–20	6.9	.54	8	8.8	8.6	4.3	8.0	11.0	39.7	19.6
51–Mont–41–29–4	B_3	20–28	7.4	.35	14	12.6	12.2	6.2	11.4	10.3	30.8	16.5
51–Mont–41–29–5	D_{ca}	28–34	8.2	.54	13	15.6	14.8	7.5	13.2	9.4	25.7	13.8
51–Mont–41–29–6	D	34–44	8.2	.15	26	20.3	18.7	10.5	17.6	7.5	15.5	9.9
Sula silt loam (Sec. 1, T. 2 N., R. 20 W., SW¼SE¼):												
51–Mont–41–40–1	A_p	0–8	6.2	1.83	<1	.9	1.0	.6	2.2	8.0	66.1	21.2
51–Mont–41–40–2	B_2	8–12	6.1	.42	<1	.4	.8	.6	2.2	8.4	63.2	24.4
51–Mont–41–40–3	B_3	12–22	6.2	.21	<1	.7	1.0	.7	2.6	9.5	60.5	25.0
51–Mont–41–40–4	B_{2b}	22–31	6.4	.23	<1	2.8	2.8	1.9	4.3	8.4	38.2	41.6
51–Mont–41–40–5	B_{3b}	31–45	8.0	.21	<1	1.6	2.4	1.7	3.9	7.4	37.5	45.5
Victor loam (Sec. 25, T. 7 N., R. 21 W., 800 ft. N. and 500 ft. W. of SE corner):												
51–Mont–41–7–1	A_p	0–7	7.8	1.87	16	17.1	20.9	10.6	10.6	4.9	23.3	12.6
51–Mont–41–7–2	B_2	7–12	6.6	.52	30	11.8	19.3	11.7	12.5	5.6	24.9	14.2
51–Mont–41–7–3	B_3	12–20	6.4	.28	33	12.1	21.6	14.0	13.4	5.1	20.1	13.7
51–Mont–41–7–4	C	20–30	6.7	.20	79	13.0	22.2	21.6	22.9	4.9	7.7	7.7
Woodside very stony sandy loam (Sec. 15, T. 5 N., R. 21 W., SW¼-NW¼):												
51–Mont–41–27–1	A_1	0–1	6.0	1.94	10	9.1	13.8	8.1	14.2	13.7	35.8	5.3
51–Mont–41–27–2	A_{21}	1–3	6.0	.75	20	9.0	13.5	7.8	12.8	13.5	37.6	5.8
51–Mont–41–27–3	A_{22}	3–11	5.5	.57	30	8.8	13.6	8.0	13.4	13.9	37.1	5.2
51–Mont–41–27–4	B_2	11–18	5.4	.28	20	7.6	12.8	7.9	13.5	14.8	37.1	6.3
51–Mont–41–27–5	C	18–27	5.4	.15	42	11.9	12.9	8.2	15.7	15.2	32.0	4.1

[1] By glass-electrode method.
[2] By wet combustion method.
[3] Excluded in calculating percentages of other size classes.

TABLE 6.—*Chemical analyses of selected soils*

[Analyses under direction of E. E. Frahm, Montana Agricultural Experiment Station]

Soil name, location, and sample number	Horizon	Depth	pH [1]	Calcium carbonate [2]	Cation exchange capacity [3]	Exchangeable sodium [4]	Conductivity of the saturation extract
		Inches		*Percent*	*m.e. per 100 gm.*	*m.e. per 100 gm.*	*k x 10³*
Amsterdam silt loam (Sec. 15, T. 7 N., R. 20 W., SE¼NW¼):							
51-Mont-41-14-1	A_p	0-10	7.1	1.1	17.2	----------	----------
51-Mont-41-14-2	B_2	10-16	7.3	1.4	18.6	----------	----------
51-Mont-41-14-3	C_{ca}	16-32	8.1	10.8	17.0	----------	----------
51-Mont-41-14-4	C_2	32-45	8.1	6.2	----------	----------	----------
51-Mont-41-14-5	C_3	45-55	8.1	6.4	----------	----------	----------
Burnt Fork loam (Sec. 23, T. 7 N., R. 20 W., 75 ft. SE of NW corner of SE¼SW¼):							
51-Mont-41-6-1	A_p	0-8	6.8	0	13.0	----------	----------
51-Mont-41-6-2	B_2	8-15	7.1	(5)	10.9	----------	----------
51-Mont-41-6-3	C_{ca}	15-24	8.1	21.5	7.4	----------	----------
51-Mont-41-6-4	C	24-36	8.1	18.9	----------	----------	----------
Corvallis silt loam, moderately saline (Sec. 28, T. 8 N., R. 20 W., SW¼SW¼):							
51-Mont-41-48-1	A_p	0-8	9.8	6.5	13.4	9.8	+15
51-Mont-41-48-2	B	8-14	9.6	11.1	16.0	13.8	9.5
51-Mont-41-48-3	C_1	14-20	9.5	11.0	12.7	12.1	6.5
51-Mont-41-48-4	C_2	20-30	9.3	2.4	10.6	8.7	3.4
51-Mont-41-48-5	C_3	30-52	8.5	0	----------	----------	.55
Gird silt loam (Sec. 20, T. 8 N., R. 19 W., NE¼SE¼):							
51-Mont-41-16-1	A_1	0-9	6.4	.7	16.4	----------	----------
51-Mont-41-16-2	B_{21}	9-14	6.7	.6	----------	----------	----------
51-Mont-41-16-3	B_{22}	14-27	7.0	.8	11.1	----------	----------
51-Mont-41-16-4	B_3	27-40	7.3	.7	----------	----------	----------
51-Mont-41-16-5	C_{ca}	40-54	8.2	2.9	13.6	----------	----------
51-Mont-41-16-6	C	54-66	8.3	1.6	----------	----------	----------
Gird silt loam, high lime subsoil variant (Sec. 30, T. 7 N., R. 19 W., SE¼NE¼):							
51-Mont-41-18-1	A_p	0-7	7.1	2.0	16.4	----------	----------
51-Mont-41-18-2	B_{21}	7-12	7.2	1.6	----------	----------	----------
51-Mont-41-18-3	B_{22}	12-21	7.7	1.6	18.9	----------	----------
51-Mont-41-18-4	C_1	21-32	8.4	10.6	9.6	----------	----------
51-Mont-41-18-5	C_2	32-45	8.6	19.8	----------	----------	----------
51-Mont-41-18-6	C_3	45-54	9.0	23.9	----------	----------	----------
Gorus silt loam (Sec. 11, T. 2 N., R. 21 W., SW¼NE¼):							
51-Mont-41-39-2	A_2	0-5	6.4	0	10.4	----------	----------
51-Mont-41-39-3	B_1	5-10	6.1	0	10.4	----------	----------
51-Mont-41-39-4	B_2	10-22	6.1	0	14.3	----------	----------
51-Mont-41-39-5	B_{2b}	22-36	7.2	0	14.3	----------	----------
51-Mont-41-39-6	B_{3b}	36-48	7.2	0	13.8	----------	----------
Haecke silt loam (Sec. 21, T. 8 N., R. 19 W., SW¼SW¼):							
51-Mont-41-17-1	A_1	0-6	6.6	.4	10.9	----------	----------
51-Mont-41-17-2	B_{21}	6-10	8.0	.8	15.2	----------	----------
51-Mont-41-17-3	B_{22}	10-14	8.7	.6	----------	----------	----------
51-Mont-41-17-4	B_{3ca}	14-20	8.6	1.5	12.2	----------	----------
51-Mont-41-17-5	B_{35a}	20-30	8.3	5.2	----------	----------	----------
51-Mont-41-17-6	C_1	30-42	9.0	5.0	----------	----------	----------
51-Mont-41-17-7	C_2	42-56	8.8	21.4	----------	----------	----------
Hamilton silt loam (Sec. 15, T. 8 N., R. 20 W., NE¼NW¼):							
51-Mont-41-10-1	A_p	0-9	7.8	1.6	26.2	----------	----------
51-Mont-41-10-2	B	9-14	7.7	1.6	23.0	----------	----------
51-Mont-41-10-3	C_{ca}	14-22	8.0	3.4	21.8	----------	----------
51-Mont-41-10-4	C_2	22-30	7.9	1.8	----------	----------	----------
51-Mont-41-10-5	C_3	30-40	7.9	4.4	----------	----------	----------
51-Mont-41-10-6	C_4	40-48	8.0	----------	----------	----------	----------
Sula silt loam (Sec. 1, T. 2 N., R. 20 W., SW¼SE¼):							
51-Mont-41-40-1	A_p	0-8	6.2	0	21.0	----------	----------
51-Mont-41-40-2	B_2	8-12	6.1	0	16.6	----------	----------
51-Mont-41-40-3	B_3	12-22	6.2	0	16.0	----------	----------
51-Mont-41-40-4	B_{2b}	22-31	6.4	(5)	32.4	----------	----------
51-Mont-41-40-5	B_{3b}	31-45	8.0	12.2	29.1	----------	----------
Victor loam (Sec. 25, T. 7 N., R. 21 W., 800 ft. N and 500 ft. W of SE corner):							
51-Mont-41-7-1	A_p	0-7	7.8	0	10.9	----------	----------
51-Mont-41-7-2	B_2	7-12	6.6	0	8.1	----------	----------
51-Mont-41-7-3	B_3	12-20	6.4	0	5.8	----------	----------
51-Mont-41-7-4	C	20-30	6.7	0	----------	----------	----------

[1] From table 5.
[2] By acid neutralization.
[3] By ammonium acetate leaching.
[4] By settling volume of sodium uranyl zinc acetate precipitate.
[5] Trace.

Soil Associations

Within the Bitterroot Valley Area there are several distinct types of landscape, on each of which a characteristic group of soils occurs in a characteristic pattern. These landscapes are called soil associations. Each is named for the most extensive soils in the association. The location and extent of the 16 soil associations in the Area are shown on the soil association map at the end of this report. The physiographic positions of some of the associations are shown in figure 2. Symbols in figure 2 identify the following soil associations: 1A—Chamokane-Slocum association; 3—Victor-Chereete association; 4A—Blodgett-Bass association; 5A—Skalkaho association; 7—Como-Woodside association; 8—Hamilton-Corvallis-Grantsdale association; 9—Dominic-Corvallis-Gallatin association; 12—Burnt Fork-Riverside-Ravalli association; 13—Willoughby association; 14—Skaggs-Cooney-Gird association; 15—Brownlee-Shook-Stecum association; and 16—Mountainous lands association. Underlying materials are identified by letters, as follows: A, recent and Pleistocene alluvium and glacial drift; B, Tertiary sediments (sandstones, silts, clays, sands, gravels, volcanic ash); C, Belt formation (quartzites, sandstones, argillites, limestones); and D, granite and gneiss.

The individual soils in each association may be very similar, as they are in the Willoughby association, or they may contrast sharply, as they do in the Chamokane-Slocum association. The individual areas may be so large that fields can be laid out within a single soil type, or they may be so small that a practical-sized field must include several kinds of soil. The farming systems that might be developed within a particular association are limited by the types of soils and by the way they are distributed in the landscape. The exact system to be followed will be affected by the cultural development of the region.

1A. Chamokane-Slocum association (flood plains and low terraces)

This association occupies flood plains and low terraces along the braided channels of the Bitterroot River. The land is crisscrossed by swales, abandoned and active channels, sloughs, and gravel bars. The soils have developed in river gravels mantled to varying depths with sandy fine earth. All of this material is alluvial in origin. Shallow gravelly soils predominate.

The native vegetation probably varied from open grassland to locally dense brushy forest of cottonwood, willow, ponderosa pine, various shrubs, and grass. Undeveloped areas still have such a cover. The Chamokane-Slocum association has two distinct parts —the flood plains next to the river channels, and the slightly higher terraces that are generally above spring overflow.

The flood plains next to the channels form an unstable strip through the center of the Area. Nearly every year they are flooded or isolated by floods during the peak of the spring runoff late in May or in June. This part of the association is shown on the detailed soil map as the Chamokane complex. Most of the soils are coarse and gravelly. Few places have as much as 20 inches of fine earth over the loose gravel. Drainage ranges from very poor to excessive.

This part of the association has had very little agricultural development. Various spots have at times been cleared and plowed, but only a few fields are now cultivated. These fields are used mostly for mixed-grass hay and occasionally for small grains. Most of the land is used for grazing. The carrying capacity is relatively low and varies markedly from season to season and year to year. Some firewood and posts are harvested. Further development of this part of the association is hindered by the flood hazard, the difficulty of irrigation, and the droughtiness of the soils.

The terraces are only slightly higher than the flood plains. They occur as large "islands" within the channeled areas and as strips along the edges of the association. They have generally level but irregular surfaces, broken here and there by channels or sloughs. They are generally above spring overflow. Chamokane and Slocum soils predominate; some Kenspur is included. The soils are associated in an intricate pattern, and the individual soil areas are so small that few fields consist of one kind of soil.

Most of the terrace areas have been developed. They support a fairly stable agriculture. Most of the farms are general livestock units on which dairying receives the most emphasis. There are some beef-cattle ranches and small truck farms. The better soils were used mostly for alfalfa and mixed grass hays, irrigated pastures, small grains, truck crops, small fruits, and gardens. Some sugar beets were produced north and southwest of Corvallis. There is enough water for irrigation of this association, but it is hard to get water on some land because of the irregular surface. It is sometimes difficult to maintain diversions from the river because of the wide variation in stream flow during the irrigation season.

1B. Alluvial land and valley slopes association (mountain valleys)

This association includes the flood plains, terraces, and valley slopes of the East and West Forks of the Bitterroot River and some of the larger side creeks. The valleys are narrow—generally less than a half-mile wide. The important soils are of the Chamokane, Clark Fork, and Gallatin series. There are some high benches of Lick soils at the mouth of Warm Springs Creek. Most of the various soils and terrace levels are so intricately associated that they are shown on the detailed soil maps as a complex of alluvial land and valley slopes. Even where it was possible to show the various soils separately, there are few large fields of one soil.

Many summer cabins and small ranches are scattered in this association. The ranches produce some mixed grass hay. The growing season is too short for grain. Because of the distance to market, there are more beef than dairy cattle. Most of the population depends upon packing and guiding or on part-time work in the forests for the major part of their income.

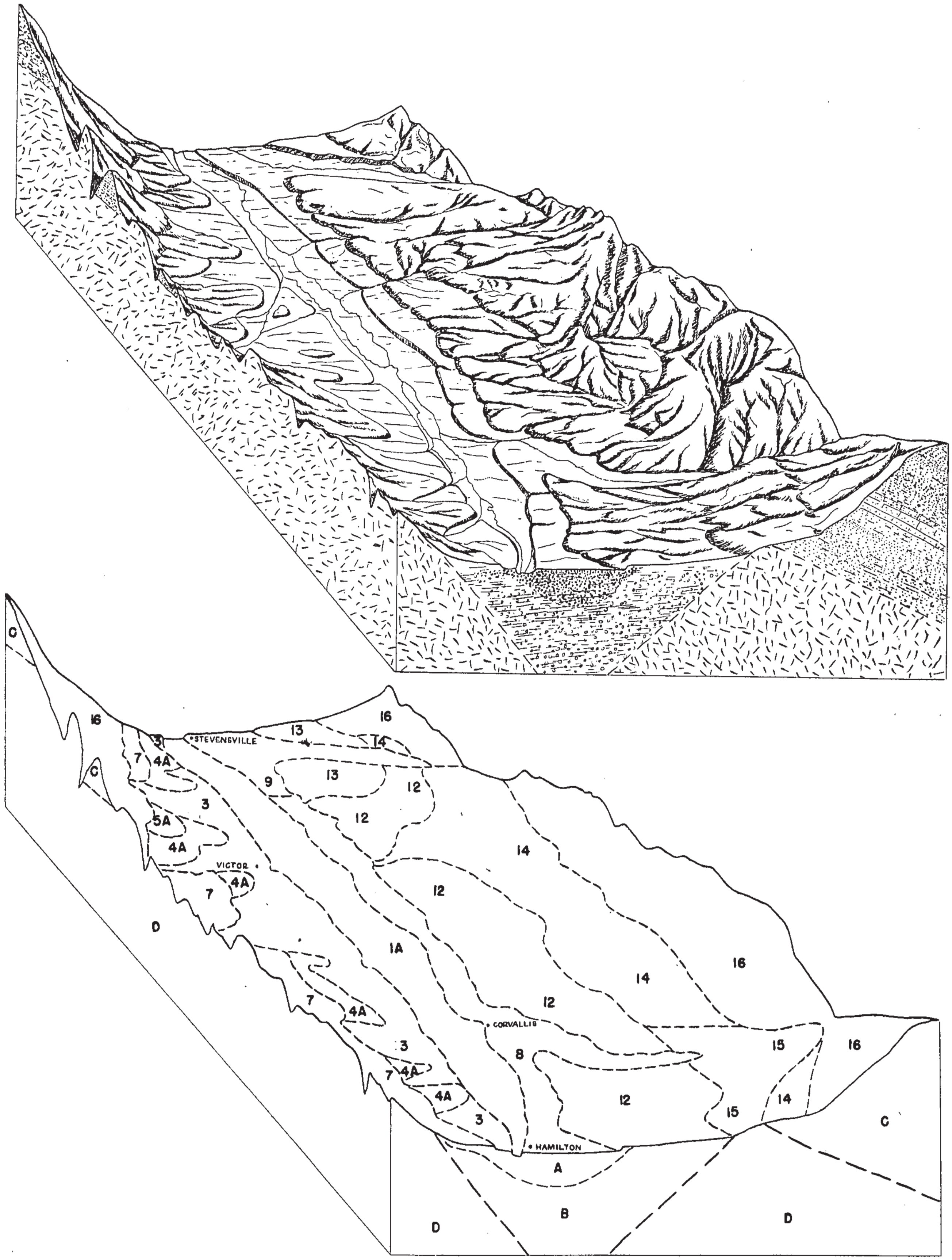

Figure 2.—Cross-section of the Bitterroot Valley Area between Stevensville and Hamilton, showing physiographic positions of soil associations in that part of the Area. See text for explanation of symbols.

2A. Chamokane-Clark Fork-Breece association (flood plains and terraces)

This association occurs along the Bitterroot River and some of the major side creeks near Darby (fig. 3). The flood plains are narrower than those downstream. Next to them are discontinuous terraces of Clark Fork, Breece, Adel, and Victor soils. The flood plains are like those of the Chamokane-Slocum association.

The terraces vary somewhat from place to place. In the valley of Sleeping Child Creek the gently sloping fans and foot slopes are mostly Breece soils, and the soils on the flood plain are mostly Gallatin. Along the Bitterroot River the terraces are Clark Fork or Victor soils, with some areas of Gallatin soils. The foot slopes and alluvial fans are either Breece or Adel soils. Along the west-side creeks the terrace soils are mostly Clark Fork or related soils, and there are no foot slopes or fans. Woodside soils occur on several areas of glacial till in the upper valley of Lost Horse Creek.

These areas are used for general farming. The better soils give good yields of hay and grain, which are grown in rotation. Truck crops and small fruits are produced near Lost Horse Creek.

2B. Gallatin association (flood plains)

This association consists of Gallatin soils and some intermingled gravel bars and sloughs. On the fringes are a few well-drained terraces of Lone Rock soil, dark-colored variant. The association occurs in Sula Basin, on the upper reaches of the East Fork of the Bitterroot River. The growing season is too short to mature small grain in all years. Most of the land is irrigated. The water supply is ample. These lands are parts of cattle ranches that depend on the nearby Brownlee-Shook-Stecum and Mountainous lands associations for summer range. Most of the association is wet meadows, which are used to produce mixed or wild hay for winter feed. These meadows are rarely plowed. A few of the better drained fields are used for alfalfa. Although little of the land is used for pasture only, all of it is grazed early in spring and in fall after the hay is harvested.

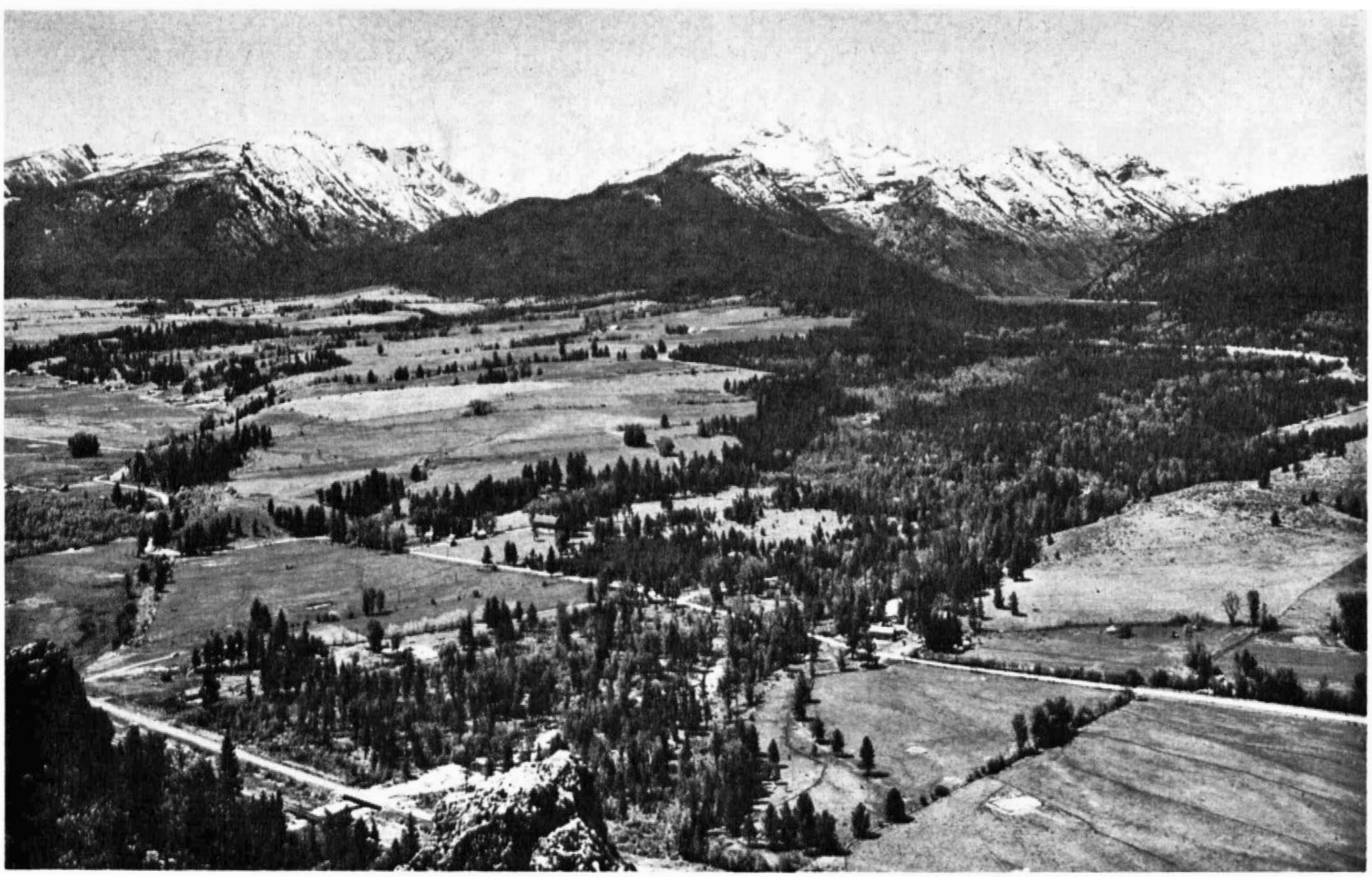

Figure 3.—Looking east across the Valley toward Como Peaks at Rock Creek. Chamokane-Clark Fork-Breece association on the flood plains and terraces in right foreground and extending up Rock Creek. Charlos-Sula-Bass association on high benches in middle ground, and Lick-Gorus association on high benches on the farthest cleared slopes. Como-Woodside association on high benches and moraines on the timbered slopes and ridges immediately above. Mountainous lands association in the background. Lake Como at the mouth of Rock Creek Canyon (upper right). This lake is the chief source of water for the Bitterroot Irrigation District on the east side of the valley. Photo by Ernst Peterson.

3. Victor-Chereete association (fans and terraces)

This association occurs on low fans and terraces formed by the major side creeks of the west side of the valley. Most of the fans and terraces begin at canyon mouths and spread toward the Bitterroot River; near the river, many of them merge into the fans of other creeks. The generally smooth topography is level to gently sloping. The creeks and their narrow flood plains are only 5 to 20 feet below the level of these fans.

The principal soils are of the Victor, Larry, and St. Joe series, or of the Chereete and Poverty series. The first three are dark-colored, well drained and imperfectly drained grassland-forest soils. The Chereete and Poverty soils are light-colored, well drained, excessively drained, and imperfectly drained forest soils. Some areas of the association consist entirely of Victor, Larry, and St. Joe soils, others entirely of Chereete and Poverty soils. In some places all of these soils are intricately intermingled. In the Victor-Larry-St. Joe areas the native vegetation was grassland and scattered evergreens. In the Chereete-Poverty areas it was dense evergreen forests of ponderosa pine, lodgepole pine, and Douglas-fir. Irrigation water comes from the creeks. Only those farmers who have early water rights get enough water for adequate full-season irrigation.

The more prosperous-appearing farms are mostly in the Victor-Larry-St. Joe areas. Most of the units are general livestock farms. Some emphasize dairying, and some beef production. On a few ranches that are partly on this association and partly on the Blodgett-Bass association, only purebred beef cattle are raised. Small farms specialize in garden vegetables, truck crops, and small fruits. The principal crops in the association are mixed grass and clover hays, some small grains to balance rotations, and pasture. Pastures range from well-kept, seeded, irrigated pastures to neglected, nonirrigated, cutover land. A considerable part of the association is in second-growth timber. The apple orchards planted in the first two decades of the century are mostly gone.

4A. Blodgett-Bass association (high benches)

This association occurs on the west-side high benches north of Lost Horse Creek. It forms the outer, or eastern, part of what was once a continuous set of fan-terraces but which is now cut into separate segments by the streams from the Bitterroot Mountains. The topography is gently sloping on the tops of the terraces; it is rolling or steep and broken around the edges. The steep and broken edges are mostly Como soils. The smooth slopes consist almost entirely of Bass and Blodgett soils. These are dark grassland-forest transition soils that developed in strongly weathered, coarse, granitic outwash. They are more or less cobbly coarse loams to sandy loams. They have fair moisture-holding capacity and fair natural fertility. Where reasonably smooth and not too steep, they can be tilled. The native vegetation was grass and scattered conifers. General livestock farms predominate. Most of the land is used for hay and pasture. There are some truck farms. The once-extensive apple orchards are mostly gone.

4B. Charlos-Sula-Bass association (high benches)

This association is a southward extension of the Blodgett-Bass association. It occurs on the outer or eastern parts of the remnants of high benches near Darby (fig. 3). These benches are not as strongly dissected as those farther north; larger areas of the original terrace surfaces remain. The topography is predominantly nearly level to rolling. Steep slopes occur around the edges of the benches. These slopes are mostly timbered, and Como soils are dominant. On the tops of the benches the native vegetation was grass and scattered conifers.

The chief soils are of the Sula, Charlos, Bass, and Blodgett series. The Sula soils developed in wind-deposited silt that mantles parts of the benches. The Charlos soils developed in outwash that has been weathered to reddish-brown loam; the Bass, in less strongly weathered reddish-brown cobbly or gravelly loam; and the Blodgett soils, in moderately weathered gravelly or cobbly sandy loams. These soils have high to moderate moisture-holding capacity and moderately high natural fertility. Where slopes are smooth and gentle enough, the soils can be tilled. General livestock farms predominate. Hay crops and pasture are the principal land uses. Irrigation water is taken from the major creeks. Not all farms have enough water for the entire season.

4C. Sula-Ravalli association (high benches)

This association occurs in French Basin, a high grassland area where the growing season is relatively short. The basin is underlain by granitic outwash materials, now weathered to the texture of loam and intricately dissected. The present topography is irregularly undulating to rolling, but some steep slopes on the edges of the benches are included. The principal soils are of the Sula and Ravalli series and are too intricately associated to be mapped separately, even on a detailed soil map. Gallatin soils occur on the narrow flood plains of Cameron Creek. Only the Gallatin soils and a few lower slopes of the Sula-Ravalli soils are irrigated. Ranching is the most common type of agriculture. Most of the area is in range. The irrigated areas are used for hay. The season is too short to grow grain.

5A. Skalkaho association (high benches)

This association occupies an area on the west-side high benches west of Victor. It is underlain by mixed hard gravels derived chiefly from igneous rocks. An area of the same kind of benches in Missoula County, also in this association, is underlain by mixed gravels derived mostly from micaceous schists. The topography in both of these areas is undulating to rolling,

except for steep edges along the drainage courses. Grass was the dominant native vegetation. The soils are chiefly of the Skalkaho series and the Skalkaho, micaceous variant. These are dark, porous, gravelly, grassland soils. Their water-holding capacities are relatively low.

Irrigation water comes from side creeks. Not all farms have enough for the whole season. General livestock farms predominate. Most of the land is in hay crops and pasture. On some idle areas there are abandoned orchards.

5B. Skalkaho-Ravalli association (high benches)

This association occurs on the higher parts of the east-side high benches north of Burnt Fork Creek. Rainfall is somewhat higher here than in the center of the valley. The soils are mostly of the Skalkaho and Ravalli series. The underlying geologic formation is the Bozeman "lake beds." This is covered to varying depths with gravelly fine earth. Where the gravelly mantle is thin, the Ravalli soils occur. Where it is thicker, the Skalkaho soils occur. The surface is somewhat gravelly or cobbly, but not enough to prevent cultivation. The general terrain is gently to moderately sloping toward the central valley. Rolling to steep slopes slant toward the local drainageways. The areas are too high to be irrigated. Most of the association has been plowed and used for small grains at some time. Nearly all has since been reseeded to crested and intermediate wheatgrass and other perennial grasses for sheep and cattle range.

6. Lick-Gorus association (high benches)

This association occurs on the same benches as the Charlos-Sula-Bass Association, but at slightly higher elevations and closer to the mountains (fig. 3). Light-colored soils that developed under dense coniferous forest predominate. The principal soils are of the Lick and Gorus series. Significant areas of the poorly drained variant of the Lick soils occur in places. These variations have developed partly because of seepage from irrigation ditches. In general the soils are deep and loamy and have high water-holding capacities. Natural fertility is moderately low. Most of the topography is rolling, but there are steep slopes around the edges and on the upper parts of the benches.

All of the areas smooth enough to cultivate were cleared and planted to apple orchards early in the century, but these orchards are nearly all gone. General livestock farming, with emphasis on hay crops and pasture, is the principal type of agriculture. Irrigation water comes from the west-side creeks. Not all farms have enough for the whole season. The rougher areas support second-growth timber, chiefly ponderosa and lodgepole pine and Douglas-fir. The virgin timber included significant numbers of large ponderosa pine more than 4 feet in diameter at breast height.

7. Como-Woodside association (high benches and moraines)

This association occurs high on the west side of the valley, along the base of the Bitterroot Mountains. It is composed of old high outwash fans and foot slopes and glacial moraines that have been dissected and now form the upper slopes of the west-side high benches (fig. 3). The underlying formations are strongly weathered coarse granitic materials. The soils are coarse gravelly, cobbly, or stony light-colored forest soils. Most of them are of the Woodside and Como series. They are droughty and low in natural fertility. Some of these soils are sloping, but most of them are steep.

All of the area has been logged once, some twice. Much of the smoother, less steep land north of Lost Horse Creek was once cleared and planted to apple orchards, but most of the orchards are gone. The land still being farmed is used for hay crops and pasture for dairy cattle. More than half of the land is in second-growth timber at various stages of growth. Irrigation water comes from the west-side creeks. The supply is not sufficient for full-season irrigation on all farms.

8. Hamilton-Corvallis-Grantsdale association (fans and terraces)

This association occupies low fans and terraces on the east side of the valley, from Grantsdale to Stevensville. It is level to gently sloping and generally smooth. The native vegetation was mostly grass. The most common soils in the association belong to the Hamilton, Corvallis, and Grantsdale series. These are fertile, loamy, dark, grassland soils, deep and moderately deep over gravel. There are also some shallow gravelly soils, such as the Dominic and the shallow phases of the Grantsdale series, and some areas of poorly drained and saline soils.

This is the most intensively farmed and productive association in the Bitterroot Valley. The area around Grantsdale has an extremely intricate pattern of soils, mostly gravelly. These soils are mostly in small farms and are used for truck crops, potatoes, small fruits, vegetables, and pasture. Grain crops are grown to balance rotations, and the larger farms produce sugar beets. The rest of the association is mostly in larger farms but is equally intensively farmed. The principal crops are sugar beets, alfalfa and clover hays, small grains, seed peas, and truck crops. Substantial acreages are used for irrigated pasture. Both dairy and beef production are important. The main source of water is the Bitterroot River. The supply is generally ample for full-season use.

9. Dominic-Corvallis-Gallatin association (fans and terraces)

This association occupies the low fans and terraces along Burnt Fork Creek. At the upper end of Burnt Fork Valley, except for a narrow terrace along the

north side, the soils are the shallow, cobbly, droughty members of the Dominic series. Nearly all of this land is used for pasture. The narrow terrace on the north side is dominated by deep, productive soils, such as the Hamilton and Breece. This terrace is irrigated and used for grain and hay.

In the central part of the valley are various phases of Gallatin and Peat soils. Drainage is generally imperfect to poor. This part of the association is used to grow mixed-grass hays and for irrigated pasture. Only a few of the better drained fields are cultivated.

In the lower part of Burnt Fork Valley is an extensive area that is chiefly Corvallis silt loam, cobbly subsoil; Corvallis silt loam, moderately shallow, slightly saline; and Grantsdale cobbly loam, imperfectly drained variant, level. Drainage in this area is generally imperfect, and many spots are very slightly saline. The land is very wet late in spring. Dairying is the most common type of agriculture. The principal crop is mixed hay. Large areas are used for irrigated pasture. Some small grains are grown in preparation for reseeding of pastures. A few of the better drained areas are intensively cropped.

Dominic soils occur on the fans where Burnt Fork Valley joins the main valley. These soils are somewhat less cobbly and less droughty than those in the upper valley of Burnt Fork Creek. The supply of irrigation water is ample. Much of the area is in general farms and small tracts. The soils are used chiefly for hay crops and pasture. Some grain and truck crops are grown.

This association is chiefly an area of irrigated general-livestock farms. The Corvallis and Gallatin soils could be farmed more intensively if drainage were improved and if new sources of irrigation water were developed.

10. Lone Rock-Slocum association (fans and terraces)

This association along Threemile Creek consists mostly of Lone Rock soils. It is fringed with Greeley, Hamilton, and Corvallis soils of the low fans and terraces. On the narrow flood plains are Slocum and Gallatin soils. Except for a few steeper bench edges, the topography is level to gently sloping. The native vegetation is chiefly grass. The Lone Rock soils are shallow, coarse, droughty, sandy, and gravelly. The other soils in the association are deeper and more loamy. The Slocum and Gallatin soils are imperfectly drained to poorly drained. The entire area is irrigated and cultivated. Water is supplied by the Bitterroot Irrigation District Canal, by ditches from local creeks, and, in the lower part, by ditches direct from the Bitterroot River. The supply varies. It is ample in some places and somewhat deficient in others. Most of the soils require frequent irrigation.

Most of the farms are small. General dairying and truck farming are the principal types of farming. Alfalfa and mixed hays, small grains, strawberries, and raspberries are grown. On the less droughty soils, sugar beets and potatoes are important crops. Substantial areas are in pasture.

11. Lolo association (fans and terraces)

This association occupies the low fan-terraces along Lolo and Eightmile Creeks. It is dominated by Lolo soils, which have developed in deep deposits of gravel mixed with fine earth. The native vegetation was mostly grass. The soils are somewhat droughty. They generally have cobblestones on the surface that interfere with cultivation. If well irrigated, they are productive. The Lolo Creek fan is irrigated and intensively farmed to grains, alfalfa, potatoes, and truck crops. Irrigation water is available for only part of the fan at Eightmile Creek; consequently, this part of the association is much less intensively farmed. The irrigated part is used mostly for alfalfa hay and to some extent for small grains and peas. The nonirrigated parts are mostly in pasture of crested wheatgrass.

12. Burnt Fork-Riverside-Ravalli association (high benches)

This association covers most of the high benches on the east side of the valley. It does not include the soils underlain by lime-cemented hardpans. The underlying geologic formations are unconsolidated to weakly consolidated Tertiary loams, gravels, sandstones, and volcanic ash. Over most of the area the surfaces have been more or less modified and mantled by silt or cobbly fine earth. Most of the topography is level to rolling, but many slopes along the drainageways and bench edges are steep. The native vegetation was mainly grass. The principal soils are of the Burnt Fork, Riverside, and Ravalli series. Lesser areas are occupied by soils of the Bitterroot, Amsterdam, and Wemple series. All of these soils are fairly well scattered through the association, except that a considerable area east of Corvallis is almost free of slick spots of Ravalli soils. Irrigation water is supplied from Lake Como, the Bitterroot River, and the east-side creeks. The supply is normally ample for full-season use, but in some seasons there may be a water shortage. A few locations are short of water in many seasons.

This is an area of general farming. Many fields are rather intensively cultivated. The principal crops are small grains, alfalfa, seed peas, truck crops, and small fruits. A few apple orchards still remain. Some sugar beets are grown on the more level areas. Dairy and beef cattle are the principal livestock. Substantial acreages are in irrigated pasture.

13. Willoughby association (high benches)

This association occupies high benches on either side of Burnt Fork Creek, as well as scattered small areas east of Hamilton. It is dominated by the Willoughby soils, which are underlain by lime-cemented hardpans. Except for the steep bench edges, the topography is level to very gently sloping. The native vegetation was mostly grasses. The principal agriculture is livestock farming, with emphasis on dairying. The soils

are used mostly for mixed hay crops and for pasture. Seepage caused by overirrigation limits the production of small grains and alfalfa in most fields. Most of the once-extensive apple orchards are gone.

14. Skaggs-Cooney-Gird association (uplands)

This soil association is on the uplands underlain by sedimentary bedrock along the east side of the valley at the foot of the Sapphire Mountains. The bedrock is chiefly pre-Cambrian quartzite, hard sandstone, and limestone of the Belt formation. The topography consists of gently rolling to steep ridges, spurs, and foot slopes. The slopes trend generally toward the valley, but there are many deviations toward local drainageways. Elevations range from about 4,200 to 5,200 feet. The average annual precipitation increases rather rapidly with the elevation.

The association includes soils of both the Chestnut (dark brown) great soil group and the Chernozem (black) great soil group. Except for some gentle to moderate slopes on ridges and foot slopes, this association is too steep to be cultivated. Most of the areas suitable for cultivation are mantled with 2 to 6 feet of wind-deposited silt (loess). The principal soils in these places are of the Skaggs, Cooney, Gird, and Haccke series. The steep slopes are mainly Lithosols, such as the Sogn, Laporte, and Castner soils. At one time or another nearly all of the arable land has been plowed. About half of it has been reseeded to grass or allowed to return to native grass. It is used, along with the steeper areas, for cattle range. The part that is still cultivated is used for small grains, chiefly wheat, under an alternate crop and fallow system.

15. Brownlee-Shook-Stecum association (uplands)

This association occurs along the mountain front on the east side of the valley and in Sula Basin. Most of the soils belong to the Chestnut (dark brown) great soil group, but some to the Chernozem (black) great soil group. The underlying materials are granite. The topography is mostly rolling to hilly, but many slopes are steep. Some of the broader gently to moderately sloping ridges are suitable for cultivation. The chief soils in these areas are of the Brownlee, Duffy, Ravalli, and Shook series. The steep slopes and some rolling areas, such as those north of Willow Creek, are chiefly Stecum soils. Most of the soils have developed under grass. Small areas have developed under pine forest. Scattered pines occur on most of the steep slopes.

The predominant use of this association is grazing. Some of the smoother ridges and slopes are used for dryland wheat under an alternate crop and fallow system. At one time or another most of the arable areas have been plowed, but only a few are still used for crops.

16. Mountainous lands association

This association consists of all mountainous lands in the survey Area, both forests and grassland. The soils vary considerably. In spite of the steep slopes, there are large areas of deep zonal soils. However, since these lands are not suitable for farming, only a superficial study was made of them. The forested areas are being used for timber, grazing, and recreation; the grassland areas are used for grazing and recreation.

Use and Management of Soils

This section consists of two main parts. The first explains how the soils are placed in capability classes, subclasses, and units, or in range sites, according to their suitability for various uses; the second gives estimated yields.

Table 7 is a guide to the first part of the section. It shows in what capability unit each soil is classified for use under irrigation and for use without irrigation, in what range site each soil suitable for range is classified, and which soils are more suitable for forest than for range. Soils for which no capability classification is given under the heading "Irrigated" are those that cannot be irrigated.

In the section, Capability classification of irrigated land, the capability classes and units for the soils under irrigation are defined, and suggestions for use and management of the soils are given. In the section, Capability classification of dryland soils, the soils classified for use without irrigation are listed according to their suitability for use.

Table 8 gives descriptions of range sites and gives suggested stocking rates by range condition classes.

The second part of this section gives estimated average acre yields that may be expected from each soil under specified management.

Capability Classification

The capability classification is a means of showing the comparative suitability of different soils for agricultural uses. The classification of a particular soil depends on the variety of uses to which it is suited, its susceptibility to erosion or other damage when it is used, and the kind of management it needs to protect it from erosion and maintain its productivity.

Capability classes.—Eight general capability classes are recognized. In classes I, II, and III are soils that are suitable for annual or periodic cultivation.

Class I soils are those that have the widest range of use and the least risk of damage. They are level or nearly level, productive, well drained, and easy to work. They can be cultivated year after year with practically no risk of erosion and will remain productive if managed with normal care.

Class II soils can be cultivated regularly but do not have quite so wide a range of suitability as class I soils. Some class II soils are gently sloping and consequently need moderate care to prevent erosion; others may be slightly droughty or slightly wet, or somewhat limited in depth.

Class III soils can be cropped regularly but have a narrower range of use and need still more careful management than soils of class II.

TABLE 7.—*Key to capability units and range sites*

[Absence of classification symbol indicates that soil was not classified for the type of management specified]

Map symbol	Soil	Capability unit		Range site [1]
		Irrigated	Dryland	
	Adel loam:			
Aa	Level	IIs-3	IIe-1	Ov-5.
Ab	Gently sloping	IIs-3	IIe-1	Ov-5.
Ac	Sloping	IIIs-4	IIIe-2	Ov-5.
	Alluvial cobbly land:			
Ad	Level	Vw-6	V	Sb-4.
Ae	Gently sloping and sloping.	Vw-6	V	Sb-4, or forest.
Af	Alluvial loamy land	Vw-6	V	Ov-6.
Ag	Alluvial land and valley slopes.		V	Forest.
	Amsterdam silt loam:			
Ah	Level	I-1	IIIe-1	Si-14.
Ak	Gently sloping	IIe-1	IIIe-1	Si-14.
Al	Sloping	IIIe-1	IIIe-1	Si-14.
Am	Moderately steep and steep.	VIe-1	VI	Si-14.
	Amsterdam-Haccke silt loams:			
An	Gently sloping	IIs-1	IIIs-2	Si-14.
Ao	Sloping	IIIs-1	IIIs-2	Si-14.
Ap	Strongly sloping	IVe-1	IVe-1	Si-14.
	Bass coarse sandy loam:			
Bg	Gently sloping	IIs-4	IVs-1	Sv-9.
Bh	Sloping	IIIs-8	IVs-1	Sv-9.
Bk	Strongly sloping	IVs-5	IVe-1	Sv-9.
	Bass cobbly coarse sandy loam:			
Ba	Gently sloping	IVs-6	IVs-1	Sv-9.
Bb	Sloping	IVs-6	IVs-1	Sv-9.
Bc	Strongly sloping	IVs-7	IVe-1	Sv-9.
	Bass gravelly coarse sandy loam:			
Bd	Gently sloping	IIIs-9	IVs-1	Sv-9.
Be	Sloping	IIIs-9	IVs-1	Sv-9.
Bf	Strongly sloping	IVs-7	IVe-1	Sv-9.
	Bass-Ravalli loams:			
Bl	Gently sloping	IIs-4	IIIs-2	Sv-9.
Bm	Sloping and strongly sloping.	IVs-5	VI	Sv-9.
	Bitterroot silt loam:			
Bn	Level	I-1	IIIe-1	Si-14.
Bo	Gently sloping	IIe-1	IIIe-1	Si-14.
Bp	Sloping	IIIe-1	IIIe-1	Si-14.
Br	Strongly sloping	IVe-1	IVe-1	Si-14.
	Bitterroot-Burnt Fork cobbly loams:			
Bs	Gently sloping	IIs-2	IIIe-1	Si-14.
Bt	Sloping	IIIs-2	IIIe-1	Si-14.
Bu	Strongly sloping	IVe-1	IVe-1	Si-14.
Bv	Bitterroot, Wemple, and Ravalli soils, shallow, moderately steep and steep.	VIe-1	VI	Si-14.
	Blodgett coarse sandy loam:			
B2c	Gently sloping	IIIs-9	IVs-1	Sv-9.
B2d	Sloping	IIIs-9	IVs-1	Sv-9.
B2e	Strongly sloping	IVs-7	IVe-1	Sv-9.
	Blodgett cobbly coarse sandy loam:			
Bw	Gently sloping	IVs-6	VI	Sv-9.
Bx	Sloping	IVs-6	VI	Sv-9.
By	Strongly sloping	IVs-7	VI	Sv-9.
	Blodgett gravelly coarse sandy loam:			
Bz	Gently sloping	IVs-6	IVs-1	Sv-9.
B2a	Sloping	IVs-6	IVs-1	Sv-9.
B2b	Strongly sloping	IVs-7	IVe-1	Sv-9.
B2f	Blodgett, Bass, and Victor very stony soils.	VIs-1	VI	Sv-9.
B2g	Blodgett and Bass soils, undifferentiated, moderately steep and steep.	VIe-1	VI	Sv-9.
	Breece loamy coarse sand:			
B2p	Gently sloping	IIIs-4	IIIs-1	Sy-11.
B2r	Sloping	IIIs-4	IIIs-1	Sy-11.
B2s	Strongly sloping	IVs-4	VI	Sy-11.
	Breece gravelly loamy coarse sand:			
B2h	Gently sloping	IVs-3	VI	Sy-11.
B2k	Sloping	IVs-3	VI	Sy-11.
B2l	Strongly sloping	IVs-4	VI	Sy-11.
	Breece sandy loam:			
B2m	Level	IIs-3	IIIs-1	Ov-5, Ov-6.
B2n	Gently sloping	IIs-3	IIIs-1	Ov-5, Ov-6.
B2o	Sloping	IIIs-4	IIIe-2	Ov-5, Ov-6.
	Brownlee-Duffy-Ravalli loams:			
B2t	Sloping	IIIs-8	IIIe-2	Si-13.
B2u	Strongly sloping	IVs-5	IVe-1	Si-13.
B2v	Moderately steep		VI	Si-13.
B2w	Steep		VII	Si-13.
B2x	Brownlee-Stecum association, mountainous.		VII	Sw-15.
	Burnt Fork loam:			
B3f	Level	I-1	IIIe-1	Si-14.
B3g	Gently sloping	IIe-1	IIIe-1	Si-14.
B3h	Sloping	IIIe-1	IIIe-1	Si-14.
B3k	Strongly sloping	IVe-1	IVe-1	Si-14.
	Burnt Fork cobbly loam:			
B2y	Gently sloping	IIs-2	IIIe-1	Si-14.
B2z	Sloping	IIIs-2	IIIe-1	Si-14.
B3a	Strongly sloping	IVe-1	IVe-1	Si-14.
	Burnt Fork gravelly loam:			
B3b	Level	IIs-2	IIIe-1	Si-14.
B3c	Gently sloping	IIs-2	IIIe-1	Si-14.
B3d	Sloping	IIIs-2	IIIe-1	Si-14.
B3e	Strongly sloping	IVe-1	IVe-1	Si-14.
	Burnt Fork very stony loam:			
B3l	Gently sloping and sloping.	VIs-1	VI	Si-14.
B3m	Strongly sloping	VIs-1	VI	Si-14.
B3n	Burnt Fork and Bitterroot soils, undifferentiated, moderately steep and steep.	VIe-1	VI	Si-14.
	Burnt Fork-Ravalli loams:			
B3s	Level	IIs-1	IIIs-2	Si-14.
B3t	Gently sloping	IIs-1	IIIs-2	Si-14.
B3u	Sloping	IIIs-1	IIIs-2	Si-14.
B3v	Strongly sloping	IVe-1	IVe-1	Si-14.
	Burnt Fork-Ravalli cobbly loams:			
B3o	Gently sloping	IIIs-3	IIIs-2	Si-14.
B3p	Sloping	IIIs-3	IIIs-2	Si-14.
B3r	Strongly sloping	IVe-1	IVe-1	Si-14.
	Burnt Fork-Ravalli loams, arkosic variants:			
B3w	Gently sloping	IIs-1	IIIs-2	Si-14.
B3x	Sloping	IIIs-1	IIIs-2	Si-14.
B3y	Strongly sloping	IVe-1	IVe-1	Si-14.
	Burnt Fork and Riverside loams, imperfectly drained (seeped):			
B3z	Level and gently sloping	Vw-6	V	Sb-4.
B4a	Sloping and strongly sloping.	VIe-1	VI	Sb-4.
B4b	Moderately steep	VIe-1	VI	Sb-4.
	Castner stony loam:			
Cm	Sloping and strongly sloping.	VIs-1	VI	Sw-15, or Sw-16.

See footnote at end of table.

TABLE 7.—*Key to capability units and range sites*—Continued

Map symbol	Soil	Capability unit		Range site [1]
		Irrigated	Dryland	
	Castner stony loam—Continued:			
Cn	Moderately steep and steep.		VII	Sw–15, or Sw–16.
Cb	Chamokane fine sandy loam.	IIIs–4	IVs–1	Forest.
Cc	Chamokane gravelly loamy sand, shallow.	VIs–1	V	Forest.
Cd	Chamokane loamy fine sand.	IVs–2	VI	Forest.
Ce	Chamokane loamy sand-sandy loam, shallow.	IVs–2	V	Forest.
Ca	Chamokane complex		V	Forest.
	Charlos loam:			
Cf	Gently sloping	IIs–4	IIIs–1	Sv–9.
Cg	Sloping	IIIs–8	IIIe–2	Sv–9.
Ch	Strongly sloping	IVs–5	IVe–1	Sv–9.
	Charlos silt loam:			
Ck	Level	IIs–4	IIIs–1	Sv–9.
Cl	Gently sloping	IIs–4	IIIs–1	Sv–9.
	Chereete stony coarse sandy loam:			
Cw	Level	VIs–1	VI	Forest.
Cx	Gently sloping	VIs–1	VI	Forest.
Cy	Sloping	VIs–1	VI	Forest.
	Chereete very stony coarse sandy loam:			
Cz	Level	VIs–1	VI	Forest.
C2a	Gently sloping	VIs–1	VI	Forest.
C2b	Sloping	VIs–1	VI	Forest.
	Chereete gravelly coarse sandy loam:			
Co	Level	VIs–1	VI	Forest.
Cp	Gently sloping	VIs–1	VI	Forest.
Cr	Sloping	VIs–1	VI	Forest.
	Chereete sandy loam:			
Cs and Cu	Level	IVs–9	VI	Forest.
Ct and Cv	Gently sloping	IVs–9	VI	Forest.
	Clark Fork fine sandy loam:			
C2f	Level	IVs–9	VI	Forest.
C2g	Gently sloping	IVs–9	VI	Forest.
C2h	Clark Fork gravelly fine sandy loam, level.	IVs–9	VI	Forest.
	Clark Fork cobbly sandy loam:			
C2c	Level	VIs–1	VI	Forest.
C2d	Gently sloping	VIs–1	VI	Forest.
C2e	Sloping	VIs–1	VI	Forest.
	Clark Fork very stony sandy loam:			
C2m	Gently sloping and sloping.	VIs–1	VI	Forest.
C2n	Strongly sloping		VI	Forest.
	Clark Fork loam:			
C2k	Level	IVs–9	IVs–2	Forest.
C2l	Gently sloping	IVs–9	IVs–2	Forest.
	Como gravelly coarse sandy loam:			
C2o	Gently sloping	IVs–9	VI	Forest.
C2p	Sloping	IVs–9	VI	Forest.
C2r	Strongly sloping	VIs–1	VI	Forest.
C2s	Moderately steep		VI	Forest.
C2t	Steep		VII	Forest.
	Como coarse sandy loam:			
C2u	Gently sloping	IVs–9	VI	Forest.
C2v	Sloping	IVs–9	VI	Forest.
C2w	Strongly sloping	VIs–1	VI	Forest.
C2x	Moderately steep		VI	Forest.
	Como stony coarse sandy loam:			
C2y	Gently sloping	VIs–1	VI	Forest.
C2z	Sloping	VIs–1	VI	Forest.
C3a	Strongly sloping	VIs–1	VI	Forest.
C3b	Moderately steep		VI	Forest.
	Como stony and very stony coarse sandy loams:			
C3c	Gently sloping	VIs–1	VI	Forest.
C3d	Sloping	VIs–1	VI	Forest.
C3e	Strongly sloping	VIs–1	VI	Forest.
C3f	Moderately steep		VI	Forest.
C3g	Steep		VII	Forest.
	Cooney loam:			
C3h	Sloping	IIIe–1	IIIe–2	Si–13.
C3k	Strongly sloping	IVe–1	IVe–1	Si–13.
C3l	Moderately steep		VI	Si–13.
	Cooney-Haccke silt loams:			
C3m	Sloping	IVs–1	IVe–1	Si–13.
C3n	Strongly sloping	IVe–1	IVe–1	Si–13.
C3o	Moderately steep	VIe–1	VI	Si–13.
C3p	Corvallis silt loam	IIw–1	IIIe–1	Sb–4.
C3r	Corvallis silt loam, poorly drained variant.	Vw–5	V	WL–2.
C3s	Corvallis silt loam, slightly saline.	IIIw–1	V	SL–8.
C3t	Corvallis silt loam, moderately saline.	IIIs–11	V	SL–8.
C3u	Corvallis silt loam, cobbly subsoil.	IIIw–1	V	Sb–4.
C3v	Corvallis silt loam, moderately shallow, slightly saline.	IIIs–11	V	SL–8.
	Dominic very cobbly sandy loam:			
De	Level	IVs–3	VI	Sw–16.
Df	Gently sloping	IVs–3	VI	Sw–16.
	Dominic cobbly loam:			
Da	Level	IIIs–6	IVs–1	Sw–16.
Db	Gently sloping	IIIs–6	IVs–1	Sw–16.
	Dominic gravelly loamy sand:			
Dc	Level	IVs–3	VI	Sw–16.
Dd	Gently sloping	IVs–3	VI	Sw–16.
Gf	Gallatin silty clay loam, level.	IVw–1	V	Sb–3, or Sb–4.
	Gallatin loam, drained:			
Ga	Level	IIw–1	IIIe–1	Sb–4.
Gb	Gently sloping	IIw–1	IIIe–1	Sb–4.
Gc	Gallatin loam-gravelly loam, level.	IVw–1	V	Sb–3, or Sb–4.
	Gallatin silt loam:			
Gd	Level	IVw–1	V	Sb–3, or Sb–4.
Ge	Gently sloping	IVw–1	V	Sb–3, or Sb–4.
	Gallatin-shallow muck complex:			
Gh	Level	Vw–5	V	WL–1.
Gk	Gently sloping	Vw–5	V	WL–1.
	Gird silt loam:			
Go	Sloping	IIIe–1	IIIe–2	Si–13.
Gp	Strongly sloping	IVe–1	IVe–1	Si–13.
Gr	Moderately steep		VI	Si–13.
Gs	Steep		VII	Si–13.
	Gird silt loam, high lime subsoil variant:			
Gt	Gently sloping	IIe–1	IIe–1	Si–13.
Gu	Sloping	IIIe–1	IIIe–2	Si–13.
Gv	Strongly sloping	IVe–1	IVe–1	Si–13.

See footnote at end of table.

TABLE 7.—*Key to capability units and range sites*—Continued

Map symbol	Soil	Capability unit: Irrigated	Capability unit: Dryland	Range site [1]
	Gird silt loam, high lime subsoil variant — Continued:			
Gw	Moderately steep		VI	Si–13.
Gx	Steep		VII	Si–13.
	Gird fine sandy loam, sandy subsoil variant:			
Gl	Gently sloping	IIs–3	IIIs–1	Sy–11.
Gm	Strongly sloping	IVe–1	IVe–1	Sy–11.
Gn	Moderately steep and steep.		VI	Sy–11.
	Gird-Haccke silt loams:			
Gy	Sloping	IIIs–1	IIIs–2	Si–13.
Gz	Strongly sloping	IVe–1	IVe–1	Si–13.
G2a	Moderately steep		VII	Si–13.
G2b	Steep		VII	Si–13.
	Gird-Teton-Haccke loams:			
G2c	Strongly sloping	IVe–1	IVe–1	Si–13.
G2d	Moderately steep		VI	Si–13.
G2e	Steep		VII	Si–13.
	Gorus silt loam:			
G2f	Gently sloping	IIIs–10	IIIs–3	Forest.
G2g	Sloping	IIIs–10	IIIs–3	Forest.
G2h	Strongly sloping	IVs–8	IVe–2	Forest.
G2k	Moderately steep		VI	Forest.
	Grantsdale loam:			
G2n	Level	IIs–3	IIIs–1	Si–14.
G2o	Gently sloping	IIs–3	IIIs–1	Si–14.
G2l	Grantsdale cobbly loam, imperfectly drained variant, level.	IIIs–11	V	SL–8.
G2m	Grantsdale cobbly loam, imperfectly drained variant, slightly saline, level.	IIIs–11	V	SL–8.
	Grantsdale loam, shallow, and Dominic sandy loam:			
G2p	Level	IIIs–4	IVs–1	Sw–16.
G2r	Gently sloping	IIIs–4	IVs–1	Sw–16.
G2u	Grantsdale and Dominic soils, very shallow, strongly sloping.	VIs–1	VI	Sw–16.
	Grantsdale-Dominic cobbly loams:			
G2s	Level	IIIs–6	IVs–1	Sw–16.
G2t	Gently sloping	IIs–6	IVs–1	Sw–16.
G2v	Gravel pits and dumps		VIII	Waste.
	Greeley sandy loam:			
G2w	Level	IIs–3	IIIs–1	Sy–12.
G2x	Gently sloping	IIIs–4	IIIs–1	Sy–12.
G2y	Sloping	IIIs–4	IIIs–1	Sy–12.
	Hamilton silt loam:			
Hc	Level	I–1	IIIe–1	Si–14.
Hd	Gently sloping	IIe–1	IIIe–1	Si–14.
	Hamilton fine sandy loam:			
Ha	Level	I–1	IIIe–1	Sy–12.
Hb	Gently sloping	IIe–1	IIIe–1	Sy–12.
He	Hamilton-Corvallis sandy loams, level.	I–1	IIIe–1	Si–14.
Hf	Hamilton-Corvallis silt loams, level.	I–1	IIIe–1	Si–14.
Hg	Holloway association, mountainous.		VII	Forest.
Ka	Kenspur fine sandy loam	IIs–3	IIIe–1	Forest.
	Laporte stony loam:			
La	Sloping and strongly sloping.		VI	Sw–15, or Sw–16.
Lb	Moderately steep and steep.		VII	Sw–15, or Sw–16.
	Larry clay loam:			
Lc	Level	Vw–2	V	Sb–3.
Ld	Drained, level	IIw–3	IIe–1	Sb–3.
	Larry clay loam—Continued:			
Le	Drained, gently sloping	IIw–3	IIe–1	Sb–3.
Lf	Gently sloping	Vw–2	V	Sb–3.
Lg	Sloping	VIe–1	VI	Sb–3.
	Larry silt loam:			
Lh	Level	VIe–1	VI	Sb–3.
Lk	Drained, level	IIw–3	IIe–1	Sb–3.
Ll	Gently sloping	Vw–2	V	Sb–3.
Lm	Drained, gently sloping	IIw–3	IIe–1	Sb–3.
Ln	Sloping	VIe–1	VI	Sb–3.
	Lick loam:			
Lu	Gently sloping	IIIs–10	IIIs–3	Forest.
Lw	Sloping	IIIs–10	IIIs–3	Forest.
Lx	Strongly sloping	IVs–8	IVe–2	Forest.
Ly	Moderately steep	VIe–1	VI	Forest.
	Lick gravelly loam:			
Lo	Gently sloping	IIIs–10	IIIs–3	Forest.
Lp	Sloping	IIIs–10	IIIs–3	Forest.
Lr	Strongly sloping	IVs–8	IVe–2	Forest.
Ls	Moderately steep		VI	Forest.
	Lick stony loam:			
L2b	Sloping	VIs–1	VI	Forest.
L2c	Strongly sloping	VIs–1	VI	Forest.
L2d	Moderately steep		VI	Forest.
L2e	Steep		VII	Forest.
	Lick loam, imperfectly drained variant:			
Lt	Level	Vw–3	V	Forest.
Lv	Gently sloping	Vw–3	V	Forest.
Lz	Sloping	VIe–1	VI	Forest.
L2a	Strongly sloping	VIe–1	VI	Forest.
	Lolo gravelly loam:			
L2g	Level	IIs–3	IVs–1	Sw–16.
L2h	Gently sloping	IIIs–6	IVs–1	Sw–16.
L2f	Lolo cobbly loam, gently sloping.	IIIs–6	IVs–1	Sw–16.
	Lone Rock coarse sandy loam:			
L2m	Level	IIIs–4	IVs–1	Sw–16.
L2n	Gently sloping	IIIs–4	VI	Sw–16.
L2o	Sloping	IVs–3	VI	Sw–16.
L2k	Lone Rock cobbly coarse sandy loam, level.	IIIs–4	VI	Sw–16.
L2l	Lone Rock fine sandy loam, dark colored variant, level.	IIIs–4	IVs–1	Sy–11.
	Maiden-Gird silt loams:			
Ma	Gently sloping	IIe–1	IIe–1	Si–13.
Mb	Sloping	IIIe–1	IIIe–2	Si–13.
Mc	Strongly sloping	IVe–1	IVe–1	Si–13.
Md	Moderately steep		VI	Si–13.
Pa	Peat	Vw–1	V	WL–2.
Pb	Peat, shallow over silt	Vw–1	V	WL–2.
Pc	Peat, shallow over gravel	Vw–1	V	WL–2.
	Poverty cobbly loam:			
Pd	Level	Vw–4	V	Forest.
Pe	Gently sloping	Vw–4	V	Forest.
Pf	Sloping	VIs–1	VI	Forest.
Pg	Poverty loam, gently sloping.	Vw–4	V	Forest.
	Poverty coarse sandy loam:			
Ph	Level	Vw–4	V	Forest.
Pk	Gently sloping	Vw–4	V	Forest.
Pl	Sloping	VIs–1	VI	Forest.
	Poverty very stony coarse sandy loam:			
Pm	Gently sloping	Vw–4	V	Forest.
Pn	Sloping	VIs–1	VI	Forest.
	Ravalli-Bitterroot cobbly loams, shallow:			
Ra	Gently sloping	VIs–1	VI	Sw–16.
Rb	Sloping	VIs–1	VI	Sw–16.
Rc	Strongly sloping	VIs–1	VI	Sw–16.

See footnote at end of table.

TABLE 7.—*Key to capability units and range sites*—Continued

Map symbol	Soil	Capability unit: Irrigated	Capability unit: Dryland	Range site [1]
	Ravalli-Bitterroot loams, shallow:			
Rd	Gently sloping	IVs-1	VI	Sw-16.
Re	Sloping	IVs-1	VI	Sw-16.
Rf	Strongly sloping	VIs-1	VI	Sw-16.
	Riverside cobbly sandy loam:			
Rk	Gently sloping	IVs-3	VI	Sw-16.
Rl	Sloping	IVs-3	VI	Sw-16.
	Riverside gravelly sandy loam:			
Rr	Gently sloping	IVs-3	VI	Sw-16.
Rs	Sloping	IVs-3	VI	Sw-16.
Rp	Riverside gravelly and cobbly sandy loams, strongly sloping.	IVs-4	VI	Sw-16.
	Riverside fine sandy loam:			
Rm	Gently sloping	IIIs-4	IVs-1	Sw-16.
Rn	Sloping	IIIs-4	IVs-1	Sw-16.
Ro	Strongly sloping	IVs-4	IVe-1	Sw-16.
	Riverside loam:			
Rt	Level	IIs-3	IVs-1	Sw-16.
Ru	Gently sloping	IIIs-4	IVs-1	Sw-16.
Rv	Sloping	IIIs-4	IVs-1	Sw-16.
Rw	Strongly sloping	IVs-4	IVe-1	Sw-16.
	Riverside cobbly loam:			
Rg	Gently sloping	IIIs-6	IVs-1	Sw-16.
Rh	Sloping	IIIs-6	VI	Sw-16.
Rx	Riverside soils, moderately steep and steep.	VIe-1	VI	Sw-16.
Ry	Riverwash		VIII	Sb-3.
	St. Joe loam and clay loam:			
Sa	Level	Vw-2	V	Sb-3.
Sb	Gently sloping	Vw-2	V	Sb-3.
Sc	Sloping	VIe-1	VI	Sb-3.
Sd	Drained, level	IIw-3	IIIs-1	Sb-3.
Se	Drained, gently sloping	IIw-3	IIIs-1	Sb-3.
	Shook coarse sandy loam:			
Sf	Sloping	IIIs-9	IIIs-1	Sy-11.
Sg	Strongly sloping	IVs-6	IVe-1	Sy-11.
Sh	Moderately steep		VI	Sy-11.
	Skaggs silt loam:			
Sk	Sloping	IIIe-1	IIIe-2	Si-13.
Sl	Strongly sloping	IVe-1	IVe-1	Si-13.
Sm	Moderately steep		VI	Si-13.
Sn	Steep		VII	Si-13.
So	Skaggs-Sogn association, mountainous.		VII	Si-13.
	Skalkaho gravelly loam:			
Sp	Gently sloping	IIIs-6	IVs-1	Sw-15.
Ss	Sloping	IIIs-6	IVs-1	Sw-15.
Su	Strongly sloping	IVs-4	IVs-1	Sw-15.
Sw	Moderately steep	VIe-1	VI	Sw-15.
	Skalkaho gravelly coarse sandy loam, micaceous variant:			
Sr	Gently sloping	IIIs-6	IVs-1	Sw-15.
St	Sloping	IIIs-6	IVs-1	Sw-15.
Sv	Strongly sloping	IVs-4	IVs-1	Sw-15.
Sx	Moderately steep	VIe-1	VI	Sw-15.
	Skalkaho-Ravalli loams:			
Sy	Gently sloping	IIIs-3	IIIs-2	Si-13.
Sz	Sloping	IIIs-3	IIIs-2	Si-13.
S2a	Strongly sloping	IVe-1	IVe-1	Si-13.
S2b	Moderately steep	VIe-1	VI	Si-13.
	Skalkaho-Ravalli stony loams:			
S2c	Sloping and strongly sloping.	VIs-1	VI	Si-13.
S2d	Moderately steep and steep.		VI	Si-13.
S2g	Slocum loam	IIw-2	V	Sb-4.
S2h	Slocum loam, deep	IIs-3	IIIs-1	Sb-4.

Map symbol	Soil	Capability unit: Irrigated	Capability unit: Dryland	Range site [1]
S2k	Slocum loam, slighty saline	IIIs-11	V	SL-8.
S2l	Slocum loam, poorly drained variant.	Vw-5	V	WL-2.
S2m	Slocum sandy loam-gravelly sandy loam, shallow.	IIw-2	V	Sb-4.
	Slocum complex, shallow:			
S2e	Slightly saline	IIIs-11	V	SL-8.
S2f	Moderately saline	IIIs-11	V	SL-8.
S2n	Slocum-shallow muck complex.	Vw-6	V	WL-2.
	Sogn-Skaggs loams and stony loams:			
S2o	Strongly sloping	IVe-1	VI	Sw-15.
S2p	Moderately steep		VI	Sw-15.
	Stecum coarse sandy loam:			
S2r	Gently sloping	IVs-9	IVs-1	Sw-15.
S2s	Sloping	IVs-9	IVs-1	Sw-15.
S2t	Strongly sloping		VI	Sw-15.
	Stecum stony loamy coarse sand:			
S2u	Sloping		VI	Sw-15.
S2v	Strongly sloping		VI	Sw-15.
S2w	Moderately steep and steep.		VII	VS-17, or VS-18.
	Sula silt loam:			
S3a	Level	IIs-4	IIe-1	Sv-9.
S3b	Gently sloping	IIs-4	IIe-1	Sv-9.
S3c	Sloping	IIIs-8	IIIe-2	Sv-9.
S3d	Strongly sloping	IVs-5	IVe-1	Sv-9.
	Sula loam variant-Ravalli loam:			
S2x	Gently sloping and sloping.	IIIs-8	IIIs-2	Si-13.
S2y	Strongly sloping	IVs-5	IVe-1	Si-13.
S2z	Moderately steep and steep.		VI	Si-13.
	Sula-Haccke silt loams:			
S3e	Sloping	IIIs-8	IIIe-2	Sv-9.
S3f	Strongly sloping	IVs-5	IVe-1	Sv-9.
Ta	Teton-Cheadle association, mountainous.		VII	Sw-15.
Tb	Trapper association, mountainous.		VII	Forest.
	Victor loam:			
Vd	Level	IIs-4	IIIs-1	Sv-9.
Ve	Gently sloping	IIs-4	IIIs-1	Sv-9.
Vh	Imperfectly drained (seeped), level.	IIw-3	IIIs-1	Sb-3.
Va	Victor cobbly coarse sandy loam, gently sloping and sloping.	IVs-6	VI	Sv-9.
	Victor gravelly coarse sandy loam:			
Vb	Level	IVs-6	IVs-1	Sv-9.
Vc	Gently sloping	IVs-6	IVs-1	Sv-9.
Vk	Sloping and strongly sloping.	IVs-6	IVs-1	Sv-9.
	Victor loam, calcareous variant:			
Vf	Level	IIs-4	IIIs-1	Sv-9.
Vg	Gently sloping	IIs-4	IIIs-1	Sv-9.
Vl	Victor-St. Joe cobbly loams, gently sloping.	Vw-6	VI	Sb-3.
	Wemple-Bitterroot-Ravalli complex:			
Wa	Level	IIs-1	IIIs-2	Si-14.
Wb	Gently sloping	IIs-1	IIIs-2	Si-14.
Wc	Sloping	IIIs-1	IIIs-2	Si-14.
Wd	Strongly sloping	IVe-1	IVe-1	Si-14.
	Willoughby loam:			
We	Level	IIIs-7	IIIs-1	Si-14.
Wf	Gently sloping	IIIs-7	IIIs-1	Si-14.

See footnote at end of table.

TABLE 7.—*Key to capability units and range sites*—Continued

Map symbol	Soil	Capability unit		Range site [1]
		Irrigated	Dryland	
	Willoughby loam—Continued:			
Wg	Sloping	IIIe-1	IIIs-1	Si-14.
Wh	Woodrock association, mountainous.	--------	VII	Forest.
	Woodside stony sandy loam:			
Wo	Gently sloping	VIs-1	VI	Forest.
Wp	Sloping	VIs-1	VI	Forest.
Wr	Strongly sloping	VIs-1	VI	Forest.
Ws	Moderately steep	--------	VI	Forest.
	Woodside very stony sandy loam:			
Wt	Gently sloping	VIs-1	VI	Forest.
Wu	Sloping	VIs-1	VI	Forest.
Wv	Strongly sloping	VIs-1	VI	Forest.
Ww	Moderately steep	--------	VI	Forest.
Wx	Steep	--------	VII	Forest.
	Woodside sandy loam:			
Wk	Gently sloping	IVs-9	IVs-2	Forest.
Wl	Sloping	IVs-9	IVs-2	Forest.
Wm	Strongly sloping	VIs-1	VI	Forest.
Wn	Moderately steep	--------	VI	Forest.

[1] Each range site symbol represents a type of native vegetation that would eventually become dominant on the area if it were not cultivated or overgrazed. "Forest" means that this soil would revert to orest if it were not cultivated or kept cleared.

In class IV are soils that should be cultivated only occasionally or only under very careful management.

In classes V, VI, and VII are soils that should not be cultivated but that can be used for pasture, for range, or for forest. Class V soils are level but are droughty, wet, low in fertility, or otherwise unsuitable for cultivation.

Class VI soils are not suitable for crops because they are steep or droughty or otherwise limited, but they give fair yields of forage or forest products. Some soils in class VI can, without damage, be cultivated enough so that fruit trees or forest trees can be set out or pasture plants can be seeded.

Class VII soils provide only poor to fair yields of forage or forest products.

In class VIII are soils that have practically no agricultural use. They produce little useful vegetation, but they may constitute attractive scenery; they may form parts of watersheds; or they may provide shelter for wildlife. Some areas have been developed as recreational sites. Steep mountains, deserts, and sand dunes are examples of class VIII land.

Capability subclasses.—The soils in any one capability class are limited to the same degree, but they may be limited for different reasons. To show the main kind of limiting factor, any one of classes II through VIII may be divided into from one to four subclasses, each identified by a letter following the capability class number. The letter "e" indicates that the risk of erosion is what limits the uses of the soil. The letter "w" is used if the soil is too wet for general use. The letter "s" shows that the soil is shallow, droughty, or unusually low in fertility.

Capability units.—Any subclass may be further divided into capability units. A capability unit is composed of soils that are limited in use to the same degree and for the same reason, and that require the same kind of management to offset their limitations.

Capability classification of irrigated land

The capability classes and units for irrigated land are described in the following pages. All of the soils in the Bitterroot Valley Area that are, or might be, irrigated are placed in these capability units. The present use, suitable crops, and suggested management of each unit are described.

CLASS I.—SOILS SUITABLE FOR PROLONGED INTENSIVE CULTIVATION; NO LIMITATIONS OR RISK OF DAMAGE IF WELL MANAGED.

Capability unit I-1.—Level, deep, loamy and slightly sandy, well-drained, dark-colored, grassland soils developed in calcareous materials.

Amsterdam silt loam, level (Ah).
Bitterroot silt loam, level (Bn).
Burnt Fork loam, level (B3f).
Hamilton fine sandy loam, level (Ha).
Hamilton silt loam, level (Hc).
Hamilton-Corvallis sandy loams, level (He).
Hamilton-Corvallis silt loams, level (Hf).

These soils occur on broad, smooth areas of the low fan-terraces and high benches of the east side and the northern part of the valley. They are intensively farmed and are highly productive. They are suitable for all crops common to the Area, including sugar beets, peas, potatoes, small grains, alfalfa, clovers, mixed hays, small fruits, and truck crops.

The soil materials can erode easily because they are almost free of coarse fragments, but erosion is not a problem because the land is level. Where leveling is necessary, these soils will stand heavy grading. The soils are well suited to furrow, border dike, or flood irrigation. Excellent response can be expected from good management that includes crop rotation and the use of manures and fertilizers.

CLASS II.—SOILS SUITABLE FOR CULTIVATION; MODERATE RISK OF DAMAGE OR LIMITATIONS IN USE.

Capability unit IIe-1.—Gently sloping, deep, loamy and slightly sandy, well-drained, dark-colored, grassland soils developed in calcareous materials.

Amsterdam silt loam, gently sloping (Ak).
Bitterroot silt loam, gently sloping (Bo).
Burnt Fork loam, gently sloping (B3g).
Gird silt loam, high lime subsoil variant, gently sloping (Gt).
Hamilton fine sandy loam, gently sloping (Hb).
Hamilton silt loam, gently sloping (Hd).
Maiden-Gird silt loams, gently sloping (Ma).

These soils occur on broad, smooth, gently sloping areas of the low fan-terraces, high benches, and uplands of the east side and the northern part of the valley. They are intensively farmed. Like the soils of capability unit I-1, they are highly productive and suitable for all crops common to the Area.

These soils are well suited to furrow, border dike, or flood irrigation. They will stand heavy grading where leveling is necessary. The soil materials are silty and free of coarse fragments; consequently they are likely to erode if irrigated carelessly, especially when they are not protected by vegetation. Ditches should follow on the contour or should be protected by linings, drops, or other structures. It may be necessary to limit the proportion of row crops in the rotation. Excellent response can be expected to management which includes legumes in the rotation, manure, and nitrogen and phosphate fertilizers.

Capability unit IIs-1.—Gently sloping and level, deep, loamy, well-drained, dark-colored, grassland soils; scattered spots have claypan beneath surface; developed in limy materials.

Amsterdam-Haccke silt loams, gently sloping (An).
Burnt Fork-Ravalli loams, level (B3s).
Burnt Fork-Ravalli loams, gently sloping (B3t).
Burnt Fork-Ravalli loams, arkosic variants, gently sloping (B3w).
Wemple-Bitterroot-Ravalli complex, level (Wa).
Wemple-Bitterroot-Ravalli complex, gently sloping (Wb).

These soils occur on relatively broad, smooth to undulating areas on the high benches of the east side. They are suitable for most crops common to the Area, except possibly sugar beets. They are now used mostly for rotations of grain and hay. Peas and truck crops are grown to a limited extent.

The scattered spots of soils with claypans (slick spots) are difficult to manage. They reduce the average yields somewhat. These slick spots will not take water readily. They are hard to till, and they may develop a crust that seedlings cannot break through. Crops tend to mature earlier on the slick spots than on the surrounding permeable soils.

Heavy and repeated applications of manure and phosphate tend to improve the tilth of these slick spots and make them easier to manage. Irrigation late in fall is desirable because it builds up the moisture content of the subsoil and substratum for the next crop year.

The soils of this unit are well suited to furrow, flood, or border dike irrigation. If leveling is necessary, grading should be as light as possible. Care should be used when irrigating the gently sloping soils, especially when they are bare of vegetation. Good response can be expected to management which includes legumes in the rotation, the use of manure, and the addition of nitrogen and phosphate fertilizers.

Capability unit IIs-2.—Level and gently sloping, deep, well-drained, dark-colored, grassland soils; loamy but have gravelly or cobbly surfaces; developed in limy materials.

Bitterroot-Burnt Fork cobbly loams, gently sloping (Bs).
Burnt Fork cobbly loam, gently sloping (B2y).
Burnt Fork gravelly loam, level (B3b).
Burnt Fork gravelly loam, gently sloping (B3c).

These soils occur on relatively broad, smooth to undulating parts of the high benches on the east side and in the northern part of the valley. They are productive soils, but the gravel and cobblestones in the surface soil somewhat restrict their use. They are suitable for most crops common to the Area, but they are now used mostly for rotations of grain and hay. Peas and truck crops are grown to a limited extent. It is best not to include tilled crops in the rotation on these soils. Stones should be removed where they interfere with the kind of agriculture practiced. Otherwise, the level soils can be managed like those in capability unit I-1, and the gently sloping soils like those of capability unit IIe-1.

Capability unit IIs-3.—Level and gently sloping, moderately deep loam or deep sandy loam, well-drained, dark-colored, grassland soils; developed in more or less calcareous materials.

Adel loam, level (Aa).
Adel loam, gently sloping (Ab).
Breece sandy loam, level (B2m).
Breece sandy loam, gently sloping (B2n).
Gird fine sandy loam, sandy subsoil variant, gently sloping (Gl).
Grantsdale loam, level (G2n).
Grantsdale loam, gently sloping (G2o).
Greeley sandy loam, level (G2w).
Kenspur fine sandy loam (Ka).
Lolo gravelly loam, level (L2g).
Riverside loam, level (Rt).
Slocum loam, deep (S2h).

These soils occur predominantly on smooth, low fan-terraces on the east side in the southern part of the valley. Riverside loam, level, occurs on east-side high benches. Kenspur fine sandy loam and Slocum loam, deep, occur on the flood plains of the Bitterroot River. Gird fine sandy loam, sandy subsoil variant, gently sloping, occurs in Sula Basin.

These are productive soils. Most of them are suited to all crops common to the Area, including sugar beets, peas, potatoes, small grains, alfalfa, clovers, mixed hays, small fruits, and truck crops. The crop suitability of Gird fine sandy loam, sandy subsoil variant, gently sloping, is limited by the short growing season; it is now used mostly for dryland farming and range. Grantsdale loam, level, and Greeley sandy loam, level, are now cultivated as intensively as the soils in capability unit I-1. The other soils of capability unit IIs-3 are now used mostly for rotations of grain and hay, and to some extent for peas and truck crops.

The moisture-holding capacity of these soils is moderately limited, therefore they require lighter and more frequent irrigation than the soils of the capability units already described. The sandy loam types, especially, require large heads of water for satisfactory irrigation by either furrow or flood methods. In some places, sprinkler irrigation will distribute water best. If leveling is necessary, only moderate grading is possible.

Excellent response can be expected from good management that includes rotation of crops and the use of manures and nitrogen and phosphate fertilizers.

Capability unit IIs-4.—Level and gently sloping, moderately deep and deep, loamy, dark-colored, grassland and forest soils; developed mostly in transported granitic materials.

Bass coarse sandy loam, gently sloping (Bg).
Bass-Ravalli loams, gently sloping (Bl).
Charlos loam, gently sloping (Cf).

Charlos silt loam, level (Ck).
Charlos silt loam, gently sloping (Cl).
Sula silt loam, level (S3a).
Sula silt loam, gently sloping (S3b).
Victor loam, level (Vd).
Victor loam, gently sloping (Ve).
Victor loam, calcareous variant, level (Vf).
Victor loam, calcareous variant, gently sloping (Vg).

These soils occur in the relatively broad, smooth parts of the west-side low fan-terraces and high benches. They are the better soils of that part of the Bitterroot Valley Area. The most commonly grown crops are mixed hays and small grains. Other suitable crops are clovers, small fruits, and truck crops.

The natural fertility of these soils is somewhat low. The soils respond to manure and to phosphate and nitrogen fertilizers, but they do not respond as well to these amendments as class I and other class II soils do. Possibly these soils have fertility deficiencies that are not yet well understood.

Sula silt loam, gently sloping, has developed in silty, stone-free material. It will erode easily if it is irrigated by either flood or furrow method when it is not protected by vegetation. Bass-Ravalli loams, gently sloping, contain scattered slick spots that have claypan subsoils. These have the same problems and need the same management as the slick spots described in capability unit IIs-1.

Capability unit IIw-1.—Level and gently sloping, deep, loamy, slightly wet, dark-colored, grassland soils; developed in calcareous materials.

Corvallis silt loam (C3p).
Gallatin loam, drained, level (Ga).
Gallatin loam, drained, gently sloping (Gb).

These soils occur on broad, smooth fan-terraces, chiefly on the east side. They are subirrigated to an extent that is beneficial. They are very productive of sugar beets, small grains, clovers, mixed hays, and pastures. Alfalfa produces well, but it lives for only a short time. If these soils were drained, they would be suitable for a wider range of crops. Manure and phosphate and nitrogen fertilizers will improve the productivity of these soils.

Capability unit IIw-2.—Level, moderately deep, moderately coherent, sandy, slightly wet, dark-colored, grassland soils; developed in sandy alluvial materials over loose gravel on flood plains.

Slocum loam (S2g).
Slocum sandy loam-gravelly sandy loam, shallow (S2m).

These soils occur on the flood plains of the Bitterroot River and of the east-side creeks. They are suited to clovers, mixed hays, pastures, small grains, and in some places to sugar beets. The productivity is moderate to moderately high. These soils are too wet for some crops, but it is not generally advisable to drain them, because their moisture-holding capacity is limited. The soils respond to manure and fertilizers.

Capability unit IIw-3.—Level and gently sloping, moderately shallow, slightly wet, dark-colored, grassland and forest soils; developed in transported granitic materials.

Larry clay loam, drained, level (Ld).
Larry clay loam, drained, gently sloping (Le).
Larry silt loam, drained, level (Lk).
Larry silt loam, drained, gently sloping (Lm).
St. Joe loam and clay loam, drained, level (Sd).
St. Joe loam and clay loam, drained, gently sloping (Se).
Victor loam, imperfectly drained (seeped), level (Vh).

These soils occur on broad, gentle, smooth to concave topography on the low fans and terraces of the west side. They are moderately productive soils. Small grains, mixed hays, clovers, and pastures are suitable crops. The soils are now commonly used for small grains in rotation with hay or pasture. If drainage were improved, these soils would be suitable for more kinds of crops. However, drainage would eliminate the subirrigation which now occurs, and the soil would lose the benefit of this extra water. The soils respond well to nitrogen and phosphate fertilizers.

CLASS III.—SOILS SUITABLE FOR CULTIVATION; SEVERE OR NUMEROUS RISKS OF DAMAGE OR LIMITATIONS IN USE.

Capability unit IIIe-1.—Sloping, deep, loamy, well-drained, dark-colored, grassland soils; developed in limy materials.

Amsterdam silt loam, sloping (Al).
Bitterroot silt loam, sloping (Bp).
Burnt Fork loam, sloping (B3h).
Cooney loam, sloping (C3h).
Gird silt loam, sloping (Go).
Gird silt loam, high lime subsoil variant, sloping (Gu).
Maiden-Gird silt loams, sloping (Mb).
Skaggs silt loam, sloping (Sk).
Willoughby loam, sloping (Wg).

These soils occur on sloping areas on the high benches and uplands of the east side and in the northern part of the valley. They differ from the soils of capability unit IIe-1 only in being on steeper slopes that are more easily eroded. The erosion danger is great if the soils are irrigated when not protected by vegetation. Ditches that run downslope must be protected by linings, drops, or other structures.

Row crops are not suited to these soils because they do not provide enough cover to protect against erosion. Most other crops common to the Area are suited to these soils. Yields are nearly as high as yields on capability unit IIe-1 soils. Excellent response can be expected to good management that includes rotation of crops and the use of manure and nitrogen and phosphate fertilizers.

In this capability unit, the soils that are now irrigated are used mostly for rotations of grain and hay or of grain and pasture. The Gird, Maiden-Gird, and Skaggs soils are above the present irrigation canals. They are used for dryland farming or for grazing.

Capability unit IIIs-1.—Sloping, deep, loamy, well-drained, dark-colored, grassland soils; scattered spots have claypan beneath surface; developed in limy materials.

Amsterdam-Haccke silt loams, sloping (Ao).
Burnt Fork-Ravalli loams, sloping (B3u).
Burnt Fork-Ravalli loams, arkosic variants, sloping (B3x).
Gird-Haccke silt loams, sloping (Gy).
Wemple - Bitterroot - Ravalli complex, sloping (Wc).

These soils occur on the smooth to rolling parts of the northern part of the valley and the high benches and uplands of the east side. They are similar to the soils of capability unit IIs-1, but they are steeper and more likely to erode if they are irrigated when bare of vegetation. Ditches that run downslope must be protected by linings, drops, or other structures. The spots of claypan soils should be managed as suggested for soils of capability unit IIs-1.

Row crops are not suited to these soils because they do not provide enough protection against erosion. Most other crops common to the Area are suitable. Yields are only a little lower than yields on soils in capability unit IIs-1. These soils respond well to manure and to nitrogen and phosphate fertilizers.

Gird-Haccke silt loams, sloping, are above the present irrigation canals; they are used for dryland farming or for grazing. The soils that are irrigated are now used mostly for rotations of grain and hay or of grain and pasture.

Capability unit IIIs-2.—Sloping, deep, well-drained, dark-colored, grassland soils; loamy but have gravelly or cobbly surfaces; developed in limy materials.

- Bitterroot-Burnt Fork cobbly loams, sloping (Bt).
- Burnt Fork cobbly loam, sloping (B2z).
- Burnt Fork gravelly loam, sloping (B3d).

These soils occur on smooth to rolling slopes in the northern part of the valley and on the high benches of the east side. They are similar to the soils of capability unit IIs-2, except that they are steeper and more likely to erode if irrigated carelessly. Erosion is especially likely when these soils are not covered by vegetation.

Most crops common to the valley, except row crops, are suited to these soils. However, because of steep slopes and cobbly or gravelly surfaces, these areas are used mostly for long rotations of hay or pasture with small grains. Mixed grass-legume hays provide better protection against erosion than alfalfa alone. These soils respond well to the use of manure and nitrogen and phosphate fertilizers.

Capability unit IIIs-3.—Gently sloping and sloping, deep, loamy, well-drained, dark-colored, grassland soils; cobbly surfaces; scattered spots have claypan beneath surface; developed in calcareous materials.

- Burnt Fork-Ravalli cobbly loams, gently sloping (B3o).
- Burnt Fork-Ravalli cobbly loams, sloping (B3p).
- Skalkaho-Ravalli loams, gently sloping (Sy).
- Skalkaho-Ravalli loams, sloping (Sz).

These soils occur on relatively broad, smooth to rolling parts of the east-side high benches. They are capable of producing most crops common to the Area. However, because of their cobbly surfaces and the scattered spots of claypan soils, they are used mostly for hay and pasture. Small grains are grown on these soils only as often as it becomes necessary to renew the hay or pasture stand or to balance the farming enterprise. Most of the Skalkaho-Ravalli loams are above the present irrigation canals and are used for grazing.

These soils will erode if irrigated when not covered by vegetation. Manure and nitrogen and phosphate fertilizers will bring good response from these soils. The spots of soil that have claypans should be managed as described for the claypan spots in the soils of capability unit IIs-1.

Capability unit IIIs-4.—Level to sloping, shallow, loamy and sandy, moderately coherent, somewhat excessively drained, dark-colored, grassland soils; developed in sandy and loamy materials over loose gravel.

- Adel loam, sloping (Ac).
- Breece sandy loam, sloping (B2o).
- Breece loamy coarse sand, gently sloping (B2p).
- Breece loamy coarse sand, sloping (B2r).
- Chamokane fine sandy loam (Cb).
- Grantsdale loam, shallow, and Dominic sandy loam, level (G2p).
- Grantsdale loam, shallow, and Dominic sandy loam, gently sloping (G2r).
- Greeley sandy loam, gently sloping (G2x).
- Greeley sandy loam, sloping (G2y).
- Lone Rock cobbly coarse sandy loam, level (L2k).
- Lone Rock fine sandy loam, dark colored variant, level (L2l).
- Lone Rock coarse sandy loam, level (L2m).
- Lone Rock coarse sandy loam, gently sloping (L2n).
- Riverside fine sandy loam, gently sloping (Rm).
- Riverside fine sandy loam, sloping (Rn).
- Riverside loam, gently sloping (Ru).
- Riverside loam, sloping (Rv).

These soils are distributed widely on flood plains, low fan-terraces, and high benches. Most of them are in the northern part of the valley and on the east side. Productivity varies rather widely. These soils are suited to most crops common to the Area, except sugar beets. The present use varies considerably. In many areas these soils are used mostly for small grains, pasture, and hay. In other areas they are used mainly for small fruits and truck crops.

The chief limitation of these soils is droughtiness. Because of their moderately low moisture-holding capacities, they require light but frequent irrigation. These soils are rapidly permeable; therefore they need large heads of water for satisfactory irrigation by flooding. Many of these soils respond very well to sprinkler irrigation. When properly irrigated, so that excessive leaching does not occur and water is always available for plant growth, these soils respond well to manure and nitrogen and phosphate fertilizers.

Capability unit IIIs-6[6].—Level to sloping, shallow and moderately shallow, somewhat excessively drained, dark-colored, grassland soils; sandy or loamy, but have gravelly or cobbly surfaces; developed in gravelly and cobbly materials.

- Dominic cobbly loam, level (Da).
- Dominic cobbly loam, gently sloping (Db).
- Grantsdale-Dominic cobbly loams, level (G2s).
- Grantsdale-Dominic cobbly loams, gently sloping (G2t).
- Lolo cobbly loam, gently sloping (L2f).
- Lolo gravelly loam, gently sloping (L2h).
- Riverside cobbly loam, gently sloping (Rg).
- Riverside cobbly loam, sloping (Rh).

[6] IIIs–5 was omitted in numbering capability units in this county.

Skalkaho gravelly loam, gently sloping (Sp).
Skalkaho gravelly coarse sandy loam, micaceous variant, gently sloping (Sr).
Skalkaho gravelly loam, sloping (Ss).
Skalkaho gravelly coarse sandy loam, micaceous variant, sloping (St).

These soils are widely distributed on the low fan-terraces and high benches. They differ from the soils of capability unit IIIs-4 chiefly in having gravelly or cobbly surfaces. Their productive capacity ranges rather widely. These soils can be used for most crops common to the Area, except those that require close cultivation. In most places pasture, hay, and small grains are grown, but in some places truck crops and small fruits are grown.

These soils have the same management requirements as the soils in capability unit IIIs-4, plus the limitations caused by the coarse fragments in the surface soils.

Capability unit IIIs-7.—Level and gently sloping, moderately deep, loamy, dark-colored, grassland soils; developed over lime-cemented hardpans.

Willoughby loam, level (We).
Willoughby loam, gently sloping (Wf).

These soils occupy broad, smooth, uneroded remnants of the east-side benches. They are very productive for mixed hay or pasture, and they are also suited to small grains and clovers. Small grains are grown only at long intervals as part of the process of reseeding the hay meadows or pastures.

The chief limitation of these soils is the impermeable hardpan that lies under them. Overirrigation will cause waterlogging. Light, frequent applications of water are best. These soils give very good response to nitrogen and phosphate fertilizers when properly irrigated.

Capability unit IIIs-8.—Sloping, moderately deep and deep, loamy, dark-colored, grassland and forest soils; developed mostly in transported granitic materials.

Bass coarse sandy loam, sloping (Bh).
Brownlee-Duffy-Ravalli loams, sloping (B2t).
Charlos loam, sloping (Cg).
Sula loam variant-Ravalli loam, gently sloping and sloping (S2x).
Sula silt loam, sloping (S3c).
Sula-Haccke silt loams, sloping (S3e).

These soils occur on smooth to rolling slopes on the high benches of the west side. They differ from the soils of capability unit IIs-4 only in being steeper. Mixed hays and small grains are the most commonly grown crops. Other crops that are suited to these soils are clovers, small fruits, and truck crops. These soils respond to the use of manure and nitrogen and phosphate fertilizers, but they do not respond so well as many other soils in the Area. These soils appear to have fertility deficiencies that are not yet well understood.

When these soils are in annual crops or bare of vegetation, it is necessary to irrigate carefully to prevent erosion. Sula-Haccke silt loams, sloping, have scattered spots of soils with claypan subsoils. These slick spots require management like that suggested for soils of capability unit IIs-1.

Capability unit IIIs-9.—Gently sloping and sloping, coarse sandy and gravelly, grassland and forest soils; developed in weathered granitic materials.

Bass gravelly coarse sandy loam, gently sloping (Bd).
Bass gravelly coarse sandy loam, sloping (Be).
Blodgett coarse sandy loam, gently sloping (B2c).
Blodgett coarse sandy loam, sloping (B2d).
Shook coarse sandy loam, sloping (Sf).

These soils occur on smooth to rolling parts of the west-side high benches. They differ from the soils in capability unit IIIs-8 in being coarser-textured and more rapidly permeable. These soils are suited to the production of clovers, mixed hays, small grains, small fruits, and truck crops, but yields are moderately low. The soils are now used mostly for mixed hay and pasture. Some small grain is grown.

The chief limitations in the use of these soils are the moderately low moisture-holding capacity and moderately low natural fertility. Scattered to numerous cobblestones occur on the surface in many areas. Light, frequent irrigation is best. As much manure as possible should be added to the soil.

These soils respond to application of nitrogen and phosphate fertilizers, but they do not respond as well as might be expected. Apparently they have fertility deficiencies that are not yet well understood.

Capability unit IIIs-10.—Gently sloping and sloping, deep, loamy, well-drained, light-colored, forest soils; developed mostly in strongly weathered transported granitic materials.

Gorus silt loam, gently sloping (G2f).
Gorus silt loam, sloping (G2g).
Lick gravelly loam, gently sloping (Lo).
Lick gravelly loam, sloping (Lp).
Lick loam, gently sloping (Lu).
Lick loam, sloping (Lw).

These soils occur on smooth to rolling parts of the high benches on the west side of the valley. They differ from the soils in capability unit IIIs-8 in having much lighter-colored surface soils containing less organic matter. The crops best suited to these soils are mixed hays, clovers, small grains, small fruits, and truck crops. Yields are low. At present, areas under irrigation are used mostly for mixed hays or for pasture. Small grain is grown occasionally as part of the process of reseeding hay meadows or pastures.

The chief limitation in the use of these soils is their low natural fertility. The soils respond to the use of manure and phosphate and nitrogen fertilizers, but this response is often not enough to make the use of fertilizer profitable. Apparently these soils have fertility deficiencies that are not yet well understood. These soils are easily eroded. They should be irrigated only when they are protected by vegetation.

Capability unit IIIs-11.—Level, shallow to deep, loamy, slightly and moderately saline, dark-colored, grassland soils.

Corvallis silt loam, moderately saline (C3t).
Corvallis silt loam, moderately shallow, slightly saline (C3v).
Grantsdale cobbly loam, imperfectly drained variant, level (G2l).

Grantsdale cobbly loam, imperfectly drained variant, slightly saline, level (G2m).
Slocum complex, shallow, slightly saline (S2e).
Slocum complex, shallow, moderately saline (S2f).
Slocum loam, slightly saline (S2k).

These soils occur on the flood plains of the Bitterroot River and on the low fan-terraces of the east-side creeks. They are slightly wet. The degree of salinity is not uniform, but it is high enough in all of these soils to interfere with crop production.

These soils are used mostly for pasture. The less saline soils are sometimes cultivated. Hay, small grains, or sugar beets are grown with fair success. The salts can be leached out by improving the drainage and using large quantities of irrigation water. However, some of the soils are so shallow over gravel that this expense is not justified. The feasibility of drainage would have to be determined separately for each area.

Capability unit IIIw-1.—Level, deep, loamy, imperfectly drained, dark-colored grassland soils; developed in calcareous silts on valley fans.

Corvallis silt loam, slightly saline (C3s).
Corvallis silt loam, cobbly subsoil (C3u).

These soils occur in relatively broad areas on the fans of Burnt Fork Creek or as scattered small areas on other east-side fans. They are now used mostly for pasture and mixed hay and to some extent for small grains and sugar beets.

If the drainage were improved enough and the soils leached to remove salts, these soils would be as productive as the soils in capability unit I-1, and they would be suited to the same crops.

CLASS IV.—SOILS SUITABLE ONLY FOR OCCASIONAL OR LIMITED CULTIVATION; VERY SEVERE OR VERY NUMEROUS LIMITATIONS IN USE OR RISKS OF DAMAGE.

Capability unit IVe-1.—Strongly sloping, deep, well-drained, dark-colored, grassland soils; loamy, but have more or less cobbly surfaces; in some areas scattered spots have claypan beneath surface; developed in calcareous materials.

Amsterdam-Haccke silt loams, strongly sloping (Ap).
Bitterroot silt loam, strongly sloping (Br).
Bitterroot-Burnt Fork cobbly loams, strongly sloping (Bu).
Burnt Fork cobbly loam, strongly sloping (B3a).
Burnt Fork gravelly loam, strongly sloping (B3e).
Burnt Fork loam, strongly sloping (B3k).
Burnt Fork-Ravalli cobbly loams, strongly sloping (B3r).
Burnt Fork-Ravalli loams, strongly sloping (B3v).
Burnt Fork-Ravalli loams, arkosic variants, strongly sloping (B3y).
Cooney loam, strongly sloping (C3k).
Cooney-Haccke silt loams, strongly sloping (C3n).
Gird fine sandy loam, sandy subsoil variant, strongly sloping (Gm).
Gird silt loam, strongly sloping (Gp).
Gird silt loam, high lime subsoil variant, strongly sloping (Gv).
Gird-Haccke silt loams, strongly sloping (Gz).
Gird-Teton-Haccke loams, strongly sloping (G2c).
Maiden-Gird silt loams, strongly sloping (Mc).
Skaggs silt loam, strongly sloping (Sl).
Skalkaho-Ravalli loams, strongly sloping (S2a).
Sogn-Skaggs loams and stony loams, strongly sloping (S2o).
Wemple-Bitterroot-Ravalli complex, strongly sloping (Wd).

These soils occur on the high benches and uplands of the east side. Many of them are not irrigated now. The irrigated areas are used mostly for hay and pasture. Small grains are occasionally grown as part of the process of reseeding hay meadows and pastures. Because of the steep slope, irrigation water must be applied carefully to prevent erosion. These soils are never irrigated when not under a protective cover of vegetation.

Capability unit IVs-1.—Gently sloping to strongly sloping, shallow and moderately shallow, loamy, well-drained, dark-colored, grassland soils; scattered spots have claypan beneath surface; developed in calcareous silts over impermeable sandstones.

Cooney-Haccke silt loams, sloping (C3m).
Ravalli-Bitterroot loams, shallow, gently sloping (Rd).
Ravalli-Bitterroot loams, shallow, sloping (Re).

These soils occur as scattered small areas on the east-side high benches and uplands. When irrigated, they are likely to become seepy. Light but frequent irrigation is best for these soils. They are used mostly for pasture or hay. Small grains are sometimes grown in the process of reseeding pastures or hay meadows.

Capability unit IVs-2.—Level, shallow, loose, sandy, excessively drained, dark-colored, grassland soils; developed in sandy alluvial materials over loose gravel.

Chamokane loamy fine sand (Cd).
Chamokane loamy sand-sandy loam, shallow (Ce).

These soils occur on the flood plains of the Bitterroot River. They are now used mostly for rotations of grain and hay or grain and pasture. Some areas are in nonirrigated pasture. Yields are moderately low.

The chief limitation of these soils is droughtiness. Light, frequent irrigation is best; sprinkler irrigation works very well on these soils. When these soils are properly irrigated, so that they are not excessively leached and water is always available for plants, they will respond to manure and to nitrogen and phosphate fertilizers.

Capability unit IVs-3.—Level to sloping, shallow, very cobbly and gravelly, excessively drained, dark-colored, grassland soils; developed in cobbly materials.

Breece gravelly loamy coarse sand, gently sloping (B2h).
Breece gravelly loamy coarse sand, sloping (B2k).
Dominic gravelly loamy sand, level (Dc).
Dominic gravelly loamy sand, gently sloping (Dd).
Dominic very cobbly sandy loam, level (De).
Dominic very cobbly sandy loam, gently sloping (Df).

- Lone Rock coarse sandy loam, sloping (L2o).
- Riverside cobbly sandy loam, gently sloping (Rk).
- Riverside cobbly sandy loam, sloping (Rl).
- Riverside gravelly sandy loam, gently sloping (Rr).
- Riverside gravelly sandy loam, sloping (Rs).

These soils occur on the fan-terraces and high benches of the east side. Most of them are too cobbly or gravelly to be suitable for tillage. Irrigated areas are used mostly for hay and pasture. These soils require light, frequent irrigation. Small grains are grown occasionally, as part of the process of reseeding hay and pasture stands.

Capability unit IVs-4.—Strongly sloping, shallow, moderately coherent, sandy, somewhat excessively drained, dark-colored, grassland soils; developed in sandy materials over loose gravel.

- Breece gravelly loamy coarse sand, strongly sloping (B2l).
- Breece loamy coarse sand, strongly sloping (B2s).
- Riverside fine sandy loam, strongly sloping (Ro).
- Riverside gravelly and cobbly sandy loams, strongly sloping (Rp).
- Riverside loam, strongly sloping (Rw).
- Skalkaho gravelly loam, strongly sloping (Su).
- Skalkaho gravelly coarse sandy loam, micaceous variant, strongly sloping (Sv).

These soils occur on fans and high benches. Some are sandy, some are gravelly, and some are too cobbly for tillage. Most of them are used for dryland grazing, but some are irrigated. Irrigated areas are used mostly for hay and pasture. Occasionally, in the process of reseeding hay and pasture, some of these areas are seeded to small grains. The fields require frequent, light irrigation. These strongly sloping soils erode easily.

Capability unit IVs-5.—Strongly sloping, moderately deep and deep, loamy, well-drained, dark-colored, grassland and forest soils; developed mostly in transported granitic materials.

- Bass coarse sandy loam, strongly sloping (Bk).
- Bass-Ravalli loams, sloping and strongly sloping (Bm).
- Brownlee-Duffy-Ravalli loams, strongly sloping (B2u).
- Charlos loam, strongly sloping (Ch).
- Sula loam variant-Ravalli loam, strongly sloping (S2y).
- Sula silt loam, strongly sloping (S3d).
- Sula-Haccke silt loams, strongly sloping (S3f).

These soils occur on the high benches of the west side. They differ from the soils in capability unit IIIs-8 only in being steeper. Because they are so steep, they are never irrigated unless well protected by a cover of vegetation. These soils are used mostly for mixed hays and for pasture. They are occasionally plowed and planted to small grains, as part of the process of reestablishing stands of hay or pasture grasses.

Capability unit IVs-6.—Gently sloping and sloping, moderately deep, moderately coherent, somewhat excessively drained, dark-colored, grassland and forest soils; sandy but have more or less gravelly and cobbly surfaces; developed in granitic materials.

- Bass cobbly coarse sandy loam, gently sloping (Ba).
- Bass cobbly coarse sandy loam, sloping (Bb).
- Blodgett cobbly coarse sandy loam, gently sloping (Bw).
- Blodgett cobbly coarse sandy loam, sloping (Bx).
- Blodgett gravelly coarse sandy loam, gently sloping (Bz).
- Blodgett gravelly coarse sandy loam, sloping (B2a).
- Shook coarse sandy loam, strongly sloping (Sg).
- Victor cobbly coarse sandy loam, gently sloping and sloping (Va).
- Victor gravelly coarse sandy loam, level (Vb).
- Victor gravelly coarse sandy loam, gently sloping (Vc).
- Victor gravelly coarse sandy loam, sloping and strongly sloping (Vk).

These soils occur on the low fan-terraces and high benches of the west side. They are used for mixed hays and pasture and to some extent for small grains, small fruits, and truck crops. Yields are moderately low.

Both droughtiness and cobbly surfaces limit the use of these soils. The soils also seem to have fertility deficiencies that are not yet well understood.

Capability unit IVs-7.—Strongly sloping, shallow, moderately coherent, somewhat excessively drained, dark-colored, grassland and forest soils; sandy but have cobbly and gravelly surfaces; developed in granitic materials.

- Bass cobbly coarse sandy loam, strongly sloping (Bc).
- Bass gravelly coarse sandy loam, strongly sloping (Bf).
- Blodgett cobbly coarse sandy loam, strongly sloping (By).
- Blodgett gravelly coarse sandy loam, strongly sloping (B2b).
- Blodgett coarse sandy loam, strongly sloping (B2e).

These soils occur on the west-side high benches. They differ from the soils of capability unit IVs-6 only in being steeper. They are used chiefly for mixed hays and pasture. Limited fertility and steepness of slope are the chief management problems.

Capability unit IVs-8.—Strongly sloping, deep, loamy, well-drained, light-colored, forest soils; developed mostly in granitic materials.

- Gorus silt loam, strongly sloping (G2h).
- Lick gravelly loam, strongly sloping (Lr).
- Lick loam, strongly sloping (Lx).

These soils occur on the high benches of the west side, chiefly near Darby. Limited fertility is a problem. Irrigated areas are used mostly for mixed hays and pasture. The soils erode very easily and should be irrigated only when they have a good vegetative cover to protect them.

Capability unit IVs-9.—Level to sloping, shallow, sandy, excessively drained, light-colored, forest soils; developed in granitic materials.

- Chereete sandy loam, level (Cs and Cu).
- Chereete sandy loam, gently sloping (Ct and Cv).
- Clark Fork fine sandy loam, level (C2f).
- Clark Fork fine sandy loam, gently sloping (C2g).

Clark Fork gravelly fine sandy loam, level (C2h).
Clark Fork loam, level (C2k).
Clark Fork loam, gently sloping (C2l).
Como gravelly coarse sandy loam, gently sloping (C2o).
Como gravelly coarse sandy loam, sloping (C2p).
Como coarse sandy loam, gently sloping (C2u).
Como coarse sandy loam, sloping (C2v).
Stecum coarse sandy loam, gently sloping (S2r).
Stecum coarse sandy loam, sloping (S2s).
Woodside sandy loam, gently sloping (Wk).
Woodside sandy loam, sloping (Wl).

These soils occur on the low fan-terraces and high benches of the west side. Irrigated areas are used mostly for pasture and mixed hays.

These soils are very droughty and of low fertility. Light, frequent irrigation is best, but this is difficult to accomplish except by sprinkling.

Capability unit IVw-1.—Level and gently sloping, imperfectly drained, black, calcareous soils of the flood plains and swales.

Gallatin loam-gravelly loam, level (Gc).
Gallatin silt loam, level (Gd).
Gallatin silt loam, gently sloping (Ge).
Gallatin silty clay loam, level (Gf).

These soils occur chiefly on the flood plains in the valleys of the East Fork and the West Fork and the side creeks of the east side. They are used mostly for native hay and pasture. These soils are too wet to be cultivated satisfactorily, unless their drainage is improved.

CLASS V.—SOILS NOT SUITABLE FOR CULTIVATION; LITTLE RISK OF DAMAGE IF USED FOR PASTURE OR FOREST.

Capability unit Vw-1.—Imperfectly drained to very poorly drained organic soils.

Peat (Pa).
Peat, shallow over silt (Pb).
Peat, shallow over gravel (Pc).

In their natural condition, these soils are too wet for any use except pasture. Some areas have been artificially drained enough to be used to grow native hay.

Capability unit Vw-2.—Level and gently sloping, loamy, moderately deep and moderately shallow, imperfectly drained to poorly drained soils; developed in noncalcareous materials.

Larry clay loam, level (Lc).
Larry clay loam, gently sloping (Lf).
Larry silt loam, level (Lh).
Larry silt loam, gently sloping (Ll).
St. Joe loam and clay loam, level (Sa).
St. Joe loam and clay loam, gently sloping (Sb).

These soils occur in swales and at the base of slopes on the west side. They are used for pasture and native hay.

Capability unit Vw-3.—Level to strongly sloping, deep, loamy, imperfectly drained, forest soils.

Lick loam, imperfectly drained variant, level (Lt).
Lick loam, imperfectly drained variant, gently sloping (Lv).

These soils occur in swales and on slopes on the high benches of the west side. They are used for wild hays or pasture.

Capability unit Vw-4.—Gently sloping and sloping, shallow, gravelly, imperfectly drained, forest soils.

Poverty cobbly loam, level (Pd).
Poverty cobbly loam, gently sloping (Pe).
Poverty loam, gently sloping (Pg).
Poverty coarse sandy loam, level (Ph).
Poverty coarse sandy loam, gently sloping (Pk).
Poverty very stony coarse sandy loam, gently sloping (Pm).

These soils occur on the low fan-terraces of the west side. The cleared areas are used for native hay and pasture. Most areas are too droughty and cobbly to be worth draining.

Capability unit Vw-5.—Level to gently sloping, imperfectly drained to poorly drained soils of the channeled flood plains.

Corvallis silt loam, poorly drained variant (C3r).
Gallatin-shallow muck complex, level (Gh).
Gallatin-shallow muck complex, gently sloping (Gk).
Slocum loam, poorly drained variant (S2l).

These soils occur on the flood plains of the Bitterroot River and the larger creeks. They are used for pasture.

Capability unit Vw-6.—Imperfectly or poorly drained (seeped) grassland soils, consisting of narrow flood plains, peat marshes, and seeped areas below irrigation canals.

Alluvial cobbly land, level (Ad).
Alluvial cobbly land, gently sloping and sloping (Ae).
Alluvial loamy land (Af).
Burnt Fork and Riverside loams, imperfectly drained (seeped), level and gently sloping (B3z).
Slocum-shallow muck complex (S2n).
Victor-St. Joe cobbly loams, gently sloping (Vl).

These are miscellaneous seeped soils which are used for pasture. They are not suitable for drainage and cultivation, but most of them are highly productive as pastures.

CLASS VI.—SOILS NOT SUITABLE FOR CULTIVATION; MODERATE RISK OF DAMAGE IF USED FOR PASTURE OR FOREST.

Capability unit VIe-1.—Steep and very steep soils.

Amsterdam silt loam, moderately steep and steep (Am).
Bitterroot, Wemple, and Ravalli soils, shallow, moderately steep and steep (Bv).
Blodgett and Bass soils, undifferentiated, moderately steep and steep (B2g).
Burnt Fork and Riverside loams, imperfectly drained (seeped), sloping and strongly sloping (B4a).
Burnt Fork and Riverside loams, imperfectly drained (seeped), moderately steep (B4b).
Burnt Fork and Bitterroot soils, undifferentiated, moderately steep and steep (B3n).
Cooney-Haccke silt loams, moderately steep (C3o).
Larry clay loam, sloping (Lg).
Larry silt loam, sloping (Ln).
Lick loam, imperfectly drained variant, sloping (Lz).
Lick loam, imperfectly drained variant, strongly sloping (L2a).
Lick loam, moderately steep (Ly).
Riverside soils, moderately steep and steep (Rx).

St. Joe loam and clay loam, sloping (Sc).
Skalkaho gravelly loam, moderately steep (Sw).
Skalkaho gravelly coarse sandy loam, micaceous variant, moderately steep (Sx).
Skalkaho-Ravalli loams, moderately steep (S2b).

These soils occur chiefly on the edges of benches. They are used for pasture. In some places they are irrigated with waste water to improve the yield of forage. Extreme care in irrigation is necessary to prevent erosion.

Capability unit VIs-1.—Level to strongly sloping, very gravelly, cobbly, or stony soils.

Blodgett, Bass, and Victor very stony soils (B2f).
Burnt Fork very stony loam, gently sloping and sloping (B3l).
Burnt Fork very stony loam, strongly sloping (B3m).
Chamokane gravelly loamy sand, shallow (Cc).
Castner stony loam, sloping and strongly sloping (Cm).
Chereete gravelly coarse sandy loam, level (Co).
Chereete gravelly coarse sandy loam, gently sloping (Cp).
Chereete gravelly coarse sandy loam, sloping (Cr).
Chereete stony coarse sandy loam, level (Cw).
Chereete stony coarse sandy loam, gently sloping (Cx).
Chereete stony coarse sandy loam, sloping (Cy).
Chereete very stony coarse sandy loam, level (Cz).
Chereete very stony coarse sandy loam, gently sloping (C2a).
Chereete very stony coarse sandy loam, sloping (C2b).
Clark Fork cobbly sandy loam, level (C2c).
Clark Fork cobbly sandy loam, gently sloping (C2d).
Clark Fork cobbly sandy loam, sloping (C2e).
Clark Fork very stony sandy loam, gently sloping and sloping (C2m).
Como gravelly coarse sandy loam, strongly sloping (C2r).
Como coarse sandy loam, strongly sloping (C2w).
Como stony coarse sandy loam, gently sloping (C2y).
Como stony coarse sandy loam, sloping (C2z).
Como stony coarse sandy loam, strongly sloping (C3a).
Como stony and very stony coarse sandy loams, gently sloping (C3c).
Como stony and very stony coarse sandy loams, sloping (C3d).
Como stony and very stony coarse sandy loams, strongly sloping (C3e).
Grantsdale and Dominic soils, very shallow, strongly sloping (G2u).
Lick stony loam, sloping (L2b).
Lick stony loam, strongly sloping (L2c).
Poverty cobbly loam, sloping (Pf).
Poverty coarse sandy loam, sloping (Pl).
Poverty very stony coarse sandy loam, sloping (Pn).
Ravalli-Bitterroot cobbly loams, shallow, gently sloping (Ra).
Ravalli-Bitterroot cobbly loams, shallow, sloping (Rb).
Ravalli-Bitterroot cobbly loams, shallow, strongly sloping (Rc).
Ravalli-Bitterroot loams, shallow, strongly sloping (Rf).
Skalkaho-Ravalli stony loams, sloping and strongly sloping (S2c).
Woodside sandy loam, strongly sloping (Wm).
Woodside stony sandy loam, gently sloping (Wo).
Woodside stony sandy loam, sloping (Wp).
Woodside stony sandy loam, strongly sloping (Wr).
Woodside very stony sandy loam, gently sloping (Wt).
Woodside very stony sandy loam, sloping (Wu).
Woodside very stony sandy loam, strongly sloping (Wv).

These soils are used for pasture. Some areas are irrigated to improve the yield of forage.

Capability classification of dryland soils

The soils of the Bitterroot Valley Area are listed below according to their capability classification when not under irrigation. The soils in classes II, III, and IV can be cultivated under dryland management; those in classes V, VI, VII, and VIII are not suitable for cultivation but may be used for range or forest. As the climate is semiarid, drought is an ever-present hazard.

Most of the areas that are regularly cultivated under dryland management are on high upland slopes on the east side of the valley. The better dryland soils are on slopes of less than 9 percent; they are more than 30 inches deep over bedrock, and they have no gravel or claypan layers.

CAPABILITY CLASS II.—SOILS SUITABLE FOR CULTIVATION; MODERATE LIMITATIONS OR RISKS OF DAMAGE.

Capability unit IIe-1.—Nearly level to gently sloping, well-drained, deep loams; moderate permeability; high moisture-holding capacity; moderate drought hazard; moderate erosion hazard; average rainfall of 13 to 18 inches per year.

Adel loam, level (Aa).
Adel loam, gently sloping (Ab).
Gird silt loam, high lime subsoil variant, gently sloping (Gt).
Larry clay loam, drained, level (Ld).
Larry clay loam, drained, gently sloping (Le).
Larry silt loam, drained, level (Lk).
Larry silt loam, drained, gently sloping (Lm).
Maiden-Gird silt loams, gently sloping (Ma).
Sula silt loam, level (S3a).
Sula silt loam, gently sloping (S3b).

CAPABILITY CLASS III.—SOILS SUITABLE FOR CULTIVATION; SEVERE OR NUMEROUS LIMITATIONS OR RISKS OF DAMAGE.

Capability unit IIIe-1.—Nearly level to sloping, well-drained, deep loams, cobbly or gravelly in some places; rapid permeability; high water-holding capacity; severe drought hazard; slight to moderate hazard of erosion; average rainfall of less than 14 inches per year.

Amsterdam silt loam, level (Ah).
Amsterdam silt loam, gently sloping (Ak).
Amsterdam silt loam, sloping (Al).
Bitterroot silt loam, level (Bn).
Bitterroot silt loam, gently sloping (Bo).
Bitterroot silt loam, sloping (Bp).
Bitterroot-Burnt Fork cobbly loams, gently sloping (Bs).
Bitterroot-Burnt Fork cobbly loams, sloping (Bt).
Burnt Fork cobbly loam, gently sloping (B2y).
Burnt Fork cobbly loam, sloping (B2z).

Burnt Fork gravelly loam, level (B3b).
Burnt Fork gravelly loam, gently sloping (B3c).
Burnt Fork gravelly loam, sloping (B3d).
Burnt Fork loam, level (B3f).
Burnt Fork loam, gently sloping (B3g).
Burnt Fork loam, sloping (B3h).
Corvallis silt loam (C3p).
Gallatin loam, drained, level (Ga).
Gallatin loam, drained, gently sloping (Gb).
Hamilton fine sandy loam, level (Ha).
Hamilton fine sandy loam, gently sloping (Hb).
Hamilton silt loam, level (Hc).
Hamilton silt loam, gently sloping (Hd).
Hamilton-Corvallis sandy loams, level (He).
Hamilton-Corvallis silt loams, level (Hf).
Kenspur fine sandy loam (Ka).

Capability unit IIIe-2.—Sloping, well-drained, moderately deep and deep loams and fine sandy loams; moderate to moderately rapid permeability; moderate to high moisture-holding capacity; moderate hazard of erosion.

Adel loam, sloping (Ac).
Breece sandy loam, sloping (B2o).
Brownlee-Duffy-Ravalli loams, sloping (B2t).
Charlos loam, sloping (Cg).
Cooney loam, sloping (C3h).
Gird silt loam, sloping (Go).
Gird silt loam, high lime subsoil variant, sloping (Gu).
Maiden-Gird silt loams, sloping (Mb).
Skaggs silt loam, sloping (Sk).
Sula silt loam, sloping (S3c).
Sula-Haccke silt loams, sloping (S3e).

Capability unit IIIs-1.—Nearly level to gently sloping, well-drained, moderately deep loams and sandy loams, usually underlain by gravel at 24 to 36 inches; moderate permeability; moderate moisture-holding capacity.

Breece sandy loam, level (B2m).
Breece sandy loam, gently sloping (B2n).
Breece loamy coarse sand, gently sloping (B2p).
Breece loamy coarse sand, sloping (B2r).
Charlos loam, gently sloping (Cf).
Charlos silt loam, level (Ck).
Charlos silt loam, gently sloping (Cl).
Gird fine sandy loam, sandy subsoil variant, gently sloping (Gl).
Grantsdale loam, level (G2n).
Grantsdale loam, gently sloping (G2o).
Greeley sandy loam, level (G2w).
Greeley sandy loam, gently sloping (G2x).
Greeley sandy loam, sloping (G2y).
St. Joe loam and clay loam, drained, level (Sd).
St. Joe loam and clay loam, drained, gently sloping (Se).
Shook coarse sandy loam, sloping (Sf).
Slocum loam, deep (S2h).
Victor loam, level (Vd).
Victor loam, gently sloping (Ve).
Victor loam, calcareous variant, level (Vf).
Victor loam, calcareous variant, gently sloping (Vg).
Victor loam, imperfectly drained (seeped), level (Vh).
Willoughby loam, level (We).
Willoughby loam, gently sloping (Wf).
Willoughby loam, sloping (Wg).

Capability unit IIIs-2.—Nearly level to sloping soils that have claypan layers below the surface; limited penetration by roots; slow permeability.

Amsterdam-Haccke silt loams, gently sloping (An).
Amsterdam-Haccke silt loams, sloping (Ao).
Bass-Ravalli loams, gently sloping (Bl).
Burnt Fork-Ravalli cobbly loams, gently sloping (B3o).
Burnt Fork-Ravalli cobbly loams, sloping (B3p).
Burnt Fork-Ravalli loams, level (B3s).
Burnt Fork-Ravalli loams, gently sloping (B3t).
Burnt Fork-Ravalli loams, sloping (B3u).
Burnt Fork-Ravalli loams, arkosic variants, gently sloping (B3w).
Burnt Fork-Ravalli loams, arkosic variants, sloping (B3x).
Gird-Haccke silt loams, sloping (Gy).
Skalkaho-Ravalli loams, gently sloping (Sy).
Skalkaho-Ravalli loams, sloping (Sz).
Sula loam variant-Ravalli loam, gently sloping and sloping (S2x).
Wemple-Bitterroot-Ravalli complex, level (Wa).
Wemple-Bitterroot-Ravalli complex, gently sloping (Wb).
Wemple - Bitterroot - Ravalli complex, sloping (Wc).

Capability unit IIIs-3.—Moderately sloping, well-drained, somewhat acid, deep loams; usually moderate permeability; high moisture-holding capacity; moderate hazard of erosion; average rainfall of more than 15 inches per year; moderate fertility; original vegetation was forest.

Gorus silt loam, gently sloping (G2f).
Gorus silt loam, sloping (G2g).
Lick gravelly loam, gently sloping (Lo).
Lick gravelly loam, sloping (Lp).
Lick loam, gently sloping (Lu).
Lick loam, sloping (Lw).

CAPABILITY CLASS IV.—SOILS SUITABLE ONLY FOR OCCASIONAL OR LIMITED CULTIVATION; VERY SEVERE OR VERY NUMEROUS RISKS OF DAMAGE.

Capability unit IVe-1.—Strongly sloping, well-drained soils ranging from sandy to loamy in texture; moderately rapid to slow permeability; moderate to high moisture-holding capacity; moderate to severe hazard of erosion.

Amsterdam-Haccke silt loams, strongly sloping (Ap).
Bass cobbly coarse sandy loam, strongly sloping (Bc).
Bass gravelly coarse sandy loam, strongly sloping (Bf).
Bass coarse sandy loam, strongly sloping (Bk).
Bitterroot silt loam, strongly sloping (Br).
Bitterroot-Burnt Fork cobbly loams, strongly sloping (Bu).
Blodgett gravelly coarse sandy loam, strongly sloping (B2b).
Blodgett coarse sandy loam, strongly sloping (B2e).
Brownlee-Duffy-Ravalli loams, strongly sloping (B2u).
Burnt Fork cobbly loam, strongly sloping (B3a).
Burnt Fork gravelly loam, strongly sloping (B3e).
Burnt Fork loam, strongly sloping (B3k).
Burnt Fork-Ravalli cobbly loams, strongly sloping (B3r).
Burnt Fork-Ravalli loams, strongly sloping (B3v).
Burnt Fork-Ravalli loams, arkosic variants, strongly sloping (B3y).
Charlos loam, strongly sloping (Ch).
Cooney loam, strongly sloping (C3k).
Cooney-Haccke silt loams, sloping (C3m).
Cooney-Haccke silt loams, strongly sloping (C3n).
Gird fine sandy loam, sandy subsoil variant, strongly sloping (Gm).

Gird silt loam, strongly sloping (Gp).
Gird silt loam, high lime subsoil variant, strongly sloping (Gv).
Gird-Haccke silt loams, strongly sloping (Gz).
Gird-Teton-Haccke loams, strongly sloping (G2c).
Maiden-Gird silt loams, strongly sloping (Mc).
Riverside fine sandy loam, strongly sloping (Ro).
Riverside loam, strongly sloping (Rw).
Shook coarse sandy loam, strongly sloping (Sg).
Skaggs silt loam, strongly sloping (Sl).
Skalkaho-Ravalli loams, strongly sloping (S2a).
Sula loam variant-Ravalli loam, strongly sloping (S2y).
Sula silt loam, strongly sloping (S3d).
Sula-Haccke silt loams, strongly sloping (S3f).
Wemple-Bitterroot-Ravalli complex, strongly sloping (Wd).

Capability unit IVe–2.—Strongly sloping, well-drained, somewhat acid, deep or moderately deep loams; moderate permeability; high moisture-holding capacity; moderate to severe hazard of erosion; average rainfall usually more than 18 inches per year; moderately low fertility; original vegetation was forest.

Gorus silt loam, strongly sloping (G2h).
Lick gravelly loam, strongly sloping (Lr).
Lick loam, strongly sloping (Lx).

Capability unit IVs–1.—Nearly level to sloping, shallow to moderately deep, somewhat gravelly or cobbly loams and sandy loams over gravels at 15 to 24 inches; moderate to moderately rapid permeability; low moisture-holding capacity.

Bass cobbly coarse sandy loam, gently sloping (Ba).
Bass cobbly coarse sandy loam, sloping (Bb).
Bass gravelly coarse sandy loam, gently sloping (Bd).
Bass gravelly coarse sandy loam, sloping (Be).
Bass coarse sandy loam, gently sloping (Bg).
Bass coarse sandy loam, sloping (Bh).
Blodgett gravelly coarse sandy loam, gently sloping (Bz).
Blodgett gravelly coarse sandy loam, sloping (B2a).
Blodgett coarse sandy loam, gently sloping (B2c).
Blodgett coarse sandy loam, sloping (B2d).
Chamokane fine sandy loam (Cb).
Dominic cobbly loam, level (Da).
Dominic cobbly loam, gently sloping (Db).
Grantsdale loam, shallow, and Dominic sandy loam, level (G2p).
Grantsdale loam, shallow, and Dominic sandy loam, gently sloping (G2r).
Grantsdale-Dominic cobbly loams, level (G2s).
Grantsdale-Dominic cobbly loams, gently sloping (G2t).
Lolo cobbly loam, gently sloping (L2f).
Lolo gravelly loam, level (L2g).
Lolo gravelly loam, gently sloping (L2h).
Lone Rock fine sandy loam, dark colored variant, level (L2l).
Lone Rock coarse sandy loam, level (L2m).
Riverside cobbly loam, gently sloping (Rg).
Riverside fine sandy loam, gently sloping (Rm).
Riverside fine sandy loam, sloping (Rn).
Riverside loam, level (Rt).
Riverside loam, gently sloping (Ru).
Riverside loam, sloping (Rv).
Skalkaho gravelly loam, gently sloping (Sp).
Skalkaho gravelly coarse sandy loam, micaceous variant, gently sloping (Sr).
Skalkaho gravelly loam, sloping (Ss).
Skalkaho gravelly coarse sandy loam, micaceous variant, sloping (St).
Skalkaho gravelly loam, strongly sloping (Su).
Skalkaho gravelly coarse sandy loam, micaceous variant, strongly sloping (Sv).
Stecum coarse sandy loam, gently sloping (S2r).
Stecum coarse sandy loam, sloping (S2s).
Victor gravelly coarse sandy loam, level (Vb).
Victor gravelly coarse sandy loam, gently sloping (Vc).
Victor gravelly coarse sandy loam, sloping and strongly sloping (Vk).

Capability unit IVs–2.—Nearly level to sloping, shallow to moderately deep loams and sandy loams; moderate to moderately rapid permeability; moderate to low moisture-holding capacity; low fertility; original vegetation was forest.

Clark Fork loam, level (C2k).
Clark Fork loam, gently sloping (C2l).
Woodside sandy loam, gently sloping (Wk).
Woodside sandy loam, sloping (Wl).

CAPABILITY CLASS V.—SOILS NOT SUITABLE FOR CULTIVATION; LITTLE RISK OF DAMAGE IF USED FOR PASTURE OR FOREST.

Alluvial cobbly land, level (Ad).
Alluvial cobbly land, gently sloping and sloping (Ae).
Alluvial loamy land (Af).
Alluvial land and valley slopes (Ag).
Burnt Fork and Riverside loams, imperfectly drained (seeped), level and gently sloping (B3z).
Chamokane complex (Ca).
Chamokane gravelly loamy sand, shallow (Cc).
Chamokane loamy sand-sandy loam, shallow (Ce).
Corvallis silt loam, poorly drained variant (C3r).
Corvallis silt loam, slightly saline (C3s).
Corvallis silt loam, moderately saline (C3t).
Corvallis silt loam, cobbly subsoil (C3u).
Corvallis silt loam, moderately shallow, slightly saline (C3v).
Gallatin loam-gravelly loam, level (Gc).
Gallatin silt loam, level (Gd).
Gallatin silt loam, gently sloping (Ge).
Gallatin silty clay loam, level (Gf).
Gallatin-shallow muck complex, level (Gh).
Gallatin-shallow muck complex, gently sloping (Gk).
Grantsdale cobbly loam, imperfectly drained variant, level (G2l).
Grantsdale cobbly loam, imperfectly drained variant, slightly saline, level (G2m).
Larry clay loam, level (Lc).
Larry clay loam, gently sloping (Lf).
Larry silt loam, level (Lh).
Larry silt loam, gently sloping (Ll).
Lick loam, imperfectly drained variant, level (Lt).
Lick loam, imperfectly drained variant, gently sloping (Lv).
Peat (Pa).
Peat, shallow over silt (Pb).
Peat, shallow over gravel (Pc).
Poverty cobbly loam, level (Pd).
Poverty cobbly loam, gently sloping (Pe).
Poverty loam, gently sloping (Pg).
Poverty coarse sandy loam, level (Ph).
Poverty coarse sandy loam, gently sloping (Pk).
Poverty very stony coarse sandy loam, gently sloping (Pm).
St. Joe loam and clay loam, level (Sa).
St. Joe loam and clay loam, gently sloping (Sb).
Slocum complex, shallow, slightly saline (S2e).
Slocum complex, shallow, moderately saline (S2f).
Slocum loam (S2g).

Slocum loam, slightly saline (S2k).
Slocum loam, poorly drained variant (S2l).
Slocum sandy loam-gravelly sandy loam, shallow (S2m).
Slocum-shallow muck complex (S2n).

CAPABILITY CLASS VI.—SOILS NOT SUITABLE FOR CULTIVATION; MODERATE RISK OF DAMAGE IF USED FOR PASTURE OR FOREST.

Amsterdam silt loam, moderately steep and steep (Am).
Bass-Ravalli loams, sloping and strongly sloping (Bm).
Bitterroot, Wemple, and Ravalli soils, shallow, moderately steep and steep (Bv).
Blodgett cobbly coarse sandy loam, gently sloping (Bw).
Blodgett cobbly coarse sandy loam, sloping (Bx).
Blodgett cobbly coarse sandy loam, strongly sloping (By).
Blodgett, Bass, and Victor very stony soils (B2f).
Blodgett and Bass soils, undifferentiated, moderately steep and steep (B2g).
Breece gravelly loamy coarse sand, gently sloping (B2h).
Breece gravelly loamy coarse sand, sloping (B2k).
Breece gravelly loamy coarse sand, strongly sloping (B2l).
Breece loamy coarse sand, strongly sloping (B2s).
Brownlee-Duffy-Ravalli loams, moderately steep (B2v).
Burnt Fork very stony loam, gently sloping and sloping (B3l).
Burnt Fork very stony loam, strongly sloping (B3m).
Burnt Fork and Bitterroot soils, undifferentiated, moderately steep and steep (B3n).
Burnt Fork and Riverside loams, imperfectly drained (seeped), sloping and strongly sloping (B4a).
Burnt Fork and Riverside loams, imperfectly drained (seeped), moderately steep (B4b).
Castner stony loam, sloping and strongly sloping (Cm).
Chamokane loamy fine sand (Cd).
Chereete gravelly coarse sandy loam, level (Co).
Chereete gravelly coarse sandy loam, gently sloping (Cp).
Chereete gravelly coarse sandy loam, sloping (Cr).
Chereete sandy loam, level (Cs and Cu).
Chereete sandy loam, gently sloping (Ct and Cv).
Chereete stony coarse sandy loam, level (Cw).
Chereete stony coarse sandy loam, gently sloping (Cx).
Chereete stony coarse sandy loam, sloping (Cy).
Chereete very stony coarse sandy loam, level (Cz).
Chereete very stony coarse sandy loam, gently sloping (C2a).
Chereete very stony coarse sandy loam, sloping (C2b).
Clark Fork cobbly sandy loam, level (C2c).
Clark Fork cobbly sandy loam, gently sloping (C2d).
Clark Fork cobbly sandy loam, sloping (C2e).
Clark Fork fine sandy loam, level (C2f).
Clark Fork fine sandy loam, gently sloping (C2g).
Clark Fork gravelly fine sandy loam, level (C2h).
Clark Fork very stony sandy loam, gently sloping and sloping (C2m).
Clark Fork very stony sandy loam, strongly sloping (C2n).
Como gravelly coarse sandy loam, gently sloping (C2o).
Como gravelly coarse sandy loam, sloping (C2p).
Como gravelly coarse sandy loam, strongly sloping (C2r).
Como gravelly coarse sandy loam, moderately steep (C2s).
Como coarse sandy loam, gently sloping (C2u).
Como coarse sandy loam, sloping (C2v).
Como coarse sandy loam, strongly sloping (C2w).
Como coarse sandy loam, moderately steep (C2x).
Como stony coarse sandy loam, gently sloping (C2y).
Como stony coarse sandy loam, sloping (C2z).
Como stony coarse sandy loam, strongly sloping (C3a).
Como stony coarse sandy loam, moderately steep (C3b).
Como stony and very stony coarse sandy loams, gently sloping (C3c).
Como stony and very stony coarse sandy loams, sloping (C3d).
Como stony and very stony coarse sandy loams, strongly sloping (C3e).
Como stony and very stony coarse sandy loams, moderately steep (C3f).
Cooney loam, moderately steep (C3l).
Cooney-Haccke silt loams, moderately steep (C3o).
Dominic gravelly loamy sand, level (Dc).
Dominic gravelly loamy sand, gently sloping (Dd).
Dominic very cobbly sandy loam, level (De).
Dominic very cobbly sandy loam, gently sloping (Df).
Gird fine sandy loam, sandy subsoil variant, moderately steep and steep (Gn).
Gird silt loam, moderately steep (Gr).
Gird silt loam, high lime subsoil variant, moderately steep (Gw).
Gird-Teton-Haccke loams, moderately steep (G2d).
Gorus silt loam, moderately steep (G2k).
Grantsdale and Dominic soils, very shallow, strongly sloping (G2u).
Laporte stony loam, sloping and strongly sloping (La).
Larry clay loam, sloping (Lg).
Larry silt loam, sloping (Ln).
Lick gravelly loam, moderately steep (Ls).
Lick loam, moderately steep (Ly).
Lick loam, imperfectly drained variant, sloping (Lz).
Lick loam, imperfectly drained variant, strongly sloping (L2a).
Lick stony loam, sloping (L2b).
Lick stony loam, strongly sloping (L2c).
Lick stony loam, moderately steep (L2d).
Lone Rock cobbly coarse sandy loam, level (L2k).
Lone Rock coarse sandy loam, gently sloping (L2n).
Lone Rock coarse sandy loam, sloping (L2o).
Maiden-Gird silt loams, moderately steep (Md).
Poverty cobbly loam, sloping (Pf).
Poverty coarse sandy loam, sloping (Pl).
Poverty very stony coarse sandy loam, sloping (Pn).
Ravalli-Bitterroot cobbly loams, shallow, gently sloping (Ra).
Ravalli-Bitterroot cobbly loams, shallow, sloping (Rb).
Ravalli-Bitterroot cobbly loams, shallow, strongly sloping (Rc).
Ravalli-Bitterroot loams, shallow, gently sloping (Rd).
Ravalli-Bitterroot loams, shallow, sloping (Re).
Ravalli-Bitterroot loams, shallow, strongly sloping (Rf).
Riverside cobbly loam, sloping (Rh).
Riverside cobbly sandy loam, gently sloping (Rk).
Riverside cobbly sandy loam, sloping (Rl).

Riverside gravelly and cobbly sandy loams, strongly sloping (Rp).
Riverside gravelly sandy loam, gently sloping (Rr).
Riverside gravelly sandy loam, sloping (Rs).
Riverside soils, moderately steep and steep (Rx).
St. Joe loam and clay loam, sloping (Sc).
Shook coarse sandy loam, moderately steep (Sh).
Skaggs silt loam, moderately steep (Sm).
Skalkaho gravelly loam, moderately steep (Sw).
Skalkaho gravelly coarse sandy loam, micaceous variant, moderately steep (Sx).
Skalkaho-Ravalli loams, moderately steep (S2b).
Skalkaho-Ravalli stony loams, sloping and strongly sloping (S2c).
Skalkaho-Ravalli stony loams, moderately steep and steep (S2d).
Sogn-Skaggs loams and stony loams, strongly sloping (S2o).
Sogn-Skaggs loams and stony loams, moderately steep (S2p).
Stecum coarse sandy loam, strongly sloping (S2t).
Stecum stony loamy coarse sand, sloping (S2u).
Stecum stony loamy coarse sand, strongly sloping (S2v).
Sula loam variant-Ravalli loam, moderately steep and steep (S2z).
Victor cobbly coarse sandy loam, gently sloping and sloping (Va).
Victor-St. Joe cobbly loams, gently sloping (Vl).
Woodside sandy loam, strongly sloping (Wm).
Woodside sandy loam, moderately steep (Wn).
Woodside stony sandy loam, gently sloping (Wo).
Woodside stony sandy loam, sloping (Wp).
Woodside stony sandy loam, strongly sloping (Wr).
Woodside stony sandy loam, moderately steep (Ws).
Woodside very stony sandy loam, gently sloping (Wt).
Woodside very stony sandy loam, sloping (Wu).
Woodside very stony sandy loam, strongly sloping (Wv).
Woodside very stony sandy loam, moderately steep (Ww).

CAPABILITY CLASS VII.—SOILS NOT SUITABLE FOR CULTIVATION; SEVERE RISK OF DAMAGE IF USED FOR PASTURE OR FOREST.

Brownlee-Duffy-Ravalli loams, steep (B2w).
Brownlee - Stecum association, mountainous (B2x).
Castner stony loam, moderately steep and steep (Cn).
Como gravelly coarse sandy loam, steep (C2t).
Como stony and very stony coarse sandy loams, steep (C3g).
Gird silt loam, steep (Gs).
Gird silt loam, high-lime subsoil variant, steep (Gx).
Gird-Haccke silt loams, moderately steep (G2a).
Gird-Haccke silt loams, steep (G2b).
Gird-Teton-Haccke loams, steep (G2e).
Holloway association, mountainous (Hg).
Laporte stony loam, moderately steep and steep (Lb).
Lick stony loam, steep (L2e).
Skaggs silt loam, steep (Sn).
Skaggs-Sogn association, mountainous (So).
Stecum stony loamy coarse sand, moderately steep and steep (S2w).
Teton-Cheadle association, mountainous (Ta).
Trapper association, mountainous (Tb).
Woodrock association, mountainous (Wh).
Woodside very stony sandy loam, steep (Wx).

CAPABILITY CLASS VIII.—SOILS NOT SUITED TO ANY AGRICULTURAL USE.

Gravel pits and dumps (G2v).
Riverwash (Ry).

Range sites and condition classes

Native range grasses are a crop, and, like any other, they respond to management. The kind of management affects the amount of forage and the opportunity for profit. An inventory of the range in terms of sites and condition classes is helpful in deciding how each kind of range can best be used.

A range site is an area of range uniform enough in climate, soil, and topography to result in a particular climax vegetation. Climax vegetation is the combination of plants that grew there before the range was affected by grazing or cultivation. Generally, the climax vegetation is the most productive combination of plants that a site can produce. If grazing is not too severe, the proportions of different plant species remain about the same. If grazing is too severe, the more palatable species (decreasers) are eliminated and their places are taken by less palatable species that were part of the original vegetation (increasers) or by other species that were not part of the climax vegetation but can now find room to grow (invaders).

Estimating range condition.—Range condition is determined by comparing the kind and amount of present vegetation with the climax vegetation for that range site. If present vegetation is almost the same as the climax vegetation, the range is in excellent condition. Ranges in good, fair, or poor condition contain fewer decreasers and more increasers and invaders than were present in the climax vegetation on that site.

Range sites in the Bitterroot Valley Area are listed in table 8. The table gives the soils in each site (by their map symbols only), a range site symbol, the dominant grasses when the site is in excellent condition, and some suggested stocking rates by condition classes. Table 9 shows for each of the sites, in the two rainfall zones, the plants that are increasers under heavy grazing and the maximum percentage (by weight of forage) that each plant makes up of the climax vegetation.

The soil conservationist or range specialist will help you estimate the condition of your range. First find the soil symbol on the map. Find this soil symbol in table 8, and note the range site symbol and the grasses that are dominant in the climax vegetation. Estimate the percentage of the present total forage each year that is produced by each species of plant. Be sure to figure this percentage on the basis of weight of annual growth. Refer to the following lists to see which plants are decreasers and invaders, and to table 9 to see which are increasers on each site. The following plants are decreasers, which produce less if the range is heavily grazed than they do if the climax vegetation is undisturbed:

Basin wildrye	Green needlegrass
Cordgrass	Subalpine needlegrasses
Mannagrasses	Spike trisetum
Canada wildrye	Tall reedgrass

TABLE 8.—*Range sites and stocking rates by condition classes*

[*Asterisk following soil symbol indicates that soil is in more than one range site]

Description	Rainfall	Range site symbol	Soils by map symbols	Dominant grasses when range is in excellent condition	Suggested s... con...	
					Excellent	Goo...
	Inches				*Acres per cow per month*[2]	*Acres p... per m...*
Wet land: Water table over the surface during part of the growing season; subirrigated.	15–19	WL–1	Gh, Gk	Mannagrass, bluejoint reedgrass, prairie cordgrass, tall grasslike plants; normally no cattails or reeds.	0.7	
	10–14	WL–2	C3r, Pa, Pb, Pc, S2l, S2n	Prairie cordgrass, bluejoint reedgrass, mannagrass, tall grasslike plants; normally no cattails or reeds.	.7	
Subirrigated: Water table rarely over the surface during the growing season, but subirrigated most of the growing season.	15–19	Sb–3	Gc*, Gd*, Ge*, Gf*, Lc, Ld, Le, Lf, Lg, Lh, Lk, Ll, Lm, Ln, Ry, Sa, Sb, Sc, Sd, Se, Vh, Vl.	Bluejoint reedgrass, alpine foxtail, tufted hairgrass, tall sedges.	1.0	
	10–14	Sb–4	Ad, Ae, B3z, B4a, B4b, C3p, C3u, Ga, Gb, Gc*, Gd*, Ge*, Gf*, S2m, S2g, S2h.	Bluejoint reedgrass, tufted hairgrass, alpine foxtail, tall sedges.	1.2	
Overflow: Areas that regularly receive more than a normal amount of moisture, because of runoff from higher slopes or from areas that have water-spreading systems, or because of stream overflow.	15–19	Ov–5	Aa, Ab, Ac, B2m*, B2n*, B2o*	Basin wildrye, bearded wheatgrass. tufted hairgrass.	1.4	
	10–14	Ov–6	Af, B2m*, B2n*, B2o*	Basin wildrye, green needlegrass, tufted hairgrass, western wheatgrass.	1.9	
Saline lowland: Overflowed or subirrigated land where salt accumulations are evident and affect kind of native vegetation.	10–14	SL–8	C3s, C3t, C3v, G2l, G2m, S2e, S2f, S2k.	Western wheatgrass, alkali cordgrass, nuttall alkaligrass, alkali sacaton.	2.3	
Savannah: Deep soils on uplands; grass cover with isolated trees is normal (climax).	15–19	Sv–9	Ba, Bb, Bc, Bd, Be, Bf, Bg, Bh, Bk, Bl, Bm, Bw, Bx, By, Bz, B2a, B2b, B2c, B2d, B2e, B2f, B2g, Cf, Cg, Ch, Ck, Cl, S3a, S3b, S3c, S3d, S3e, S3f, Va, Vb, Vc, Vd, Ve, Vf, Vg, Vk.	Richardsons needlegrass, rough fescue, bluebunch wheatgrass, mountain brome.	1.7	
Sandy: Deep sandy loams and loamy very fine sands.	15–19	Sy–11	B2h, B2k, B2l, B2p, B2r, B2s, Gl, Gm, Gn, L2l, Sf, Sg, Sh.	Rough fescue, green needlegrass, Indian ricegrass, prairie sandreed.	1.8	
	10–14	Sy–12	G2w, G2x, G2y, Ha, Hb	Bluebunch wheatgrass, Indian ricegrass, needle-and-thread, prairie sandreed.	2.6	

TABLE 8.—*Range sites and stocking rates by condition classes*—Continued

Description	Rainfall	Range site symbol	Soils by map symbols	Dominant grasses when range is in excellent condition	Suggested s… con…	
					Excellent	Goo…
	Inches				*Acres per cow per month*[2]	*Acres p… per m…*
Silty: Deep very fine sandy loams, loams, silt loams, and silts.	15–19	Si–13	B2t, B2u, B2v, B2w, C3h, C3k, C3l, C3m, C3n, C3o, Go, Gp, Gr, Gs, Gt, Gu, Gv, Gw, Gx, Gy, Gz, G2a, G2b, G2c, G2d, G2e, Ma, Mb, Mc, Md, Sk, Sl, Sm, Sn, So, Sy, Sz, S2a, S2b, S2c, S2d, S2x, S2y, S2z.	Rough fescue, bluebunch wheatgrass, subalpine needlegrass, big bluegrass.	1.9	
	10–14	Si–14	Ah, Ak, Al, Am, An, Ao, Ap, Bn, Bo, Bp, Br, Bs, Bt, Bu, Bv, B2y, B2z, B3a, B3b, B3c, B3d, B3e, B3f, B3g, B3h, B3k, B3l, B3m, B3n, B3o, B3p, B3r, B3s, B3t, B3u, B3v, B3w, B3x, B3y, G2n, G2o, Hc, Hd, He, Hf, Wa, Wb, Wc, Wd, We, Wf, Wg.	Bluebunch wheatgrass, green needlegrass, Idaho fescue.	2.9	
Shallow: Shallow soils, 10 to 20 inches deep over loose gravel or hard rock.	15–19	Sw–15	B2x, Cm*, Cn*, La*, Lb*, Sp, Sr, Ss, St, Su, Sv, Sw, Sx, S2o, S2p, S2r, S2s, S2t, S2u, S2v, Ta.	Bluebunch wheatgrass, rough fescue, Idaho fescue, western wheatgrass.	2.6	
	10–14	Sw–16	Cm*, Cn*, Da, Db, Dc, Dd, De, Df, G2p, G2r, G2s, G2t, G2u, La*, Lb*; L2f, L2g, L2h, L2k, L2m, L2n, L2o, Ra, Rb, Rc, Rd, Re, Rf, Rg, Rh, Rk, Rl, Rm, Rn, Ro, Rp, Rr, Rs, Rt, Ru, Rv, Rw, Rx.	Bluebunch wheatgrass, Idaho fescue, western wheatgrass.	4.3	
Very shallow: Areas where few roots can penetrate deeper than 10 inches. Exposure of bedrock is characteristic, but deep pockets of soil develop in joints. Joints are usually marked by tall grasses, shrubs, or stunted trees.	15–19	VS–17	S2w*	Bluebunch wheatgrass, Idaho fescue, timber danthonia, prairie junegrass.	6.3	
	10–14	VS–18	S2w*	Bluebunch wheatgrass, needle-and-thread, western wheatgrass, Idaho fescue.	8.0	1…

[1] Stocking rates for good, fair, and poor conditions will permit range to return to excellent condition. Range in poor condition may require complete rest from grazing and may need reseeding to bring it back to an excellent condition.

[2] Acres required to feed one thousand-pound ani… year of normal rainfall. To determine number of acr… multiply by the number of months in the grazing se…

TABLE 9.—*Important species of native range plants that increase when the range site is heavily grazed, and maximum percentages of each in climax vegetation on given range sites in two rainfall zones*

[Figures show the maximum percentage (by total weight of forage produced during the growing season) in the climax vegetation. Absence of figure indicates that the species is not present or composes less than 2½ percent of the climax vegetation on this range site]

Species	Maximum percentage in climax vegetation															
	Rainfall of 15 to 19 inches								Rainfall of 10 to 14 inches							
	WL	Sb	Ov	Sv	Sy	Si	Sw	VS	WL	Sb	Ov	SL	Sy	Si	Sw	VS
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Western wheatgrass			10	10	5	15	15	[1]		10	25	[1]	15	15	15	[1]
Idaho fescue				25	25	25	30	35					[1]	[1]	[1]	[1]
Tufted hairgrass	25	25	20	[1]	[1]	[1]	[1]		[1]	[1]	[1]					
Needle-and-thread				5	15	10	10	[1]					30	20	20	[1]
Danthonia				10	5	5	10	[1]								
Prairie junegrass				5	5	5	10	[1]				[1]	10	10	10	[1]
Plains reedgrass				5	5	5	10	15			5	[1]	5	5	10	5
Blue grama													5	5	5	15
Sandberg bluegrass				5	5	5	5	5					5	5	5	10
Squirreltail												5				5
Red three-awn																5
Mountain muhly							5	10						5	5	10
Mat muhly		5	5							5	5	10				
Saltgrass												15				
Threadleaf sedge							5	10					5	5	5	15
Dryland sedge				10				5							5	5
Lupine				5	5	5	5	5			5		5	5	5	
Phlox								5								5
Pricklypear																
Balsamroot				5	5	5	10	15					5	5	5	5
Fringed sagewort								5							5	5
Big sagebrush				5	5	5	5						5	5	5	
Snowberry			5	5							5					
Greasewood												10				
Conifers				15				10								5
Other woody plants	10	10	10	5	5	5	5	5	5	5	10	5	5	5	5	5

[1] This species is a decreaser on this range site.

Foxtails	Indian ricegrass
Rough fescue	Big bluegrass
Spike fescue	Canby bluegrass
Mountain bromes	Alkali sacaton
Prairie sandreed	Winterfat
Bluebunch wheatgrass	Bitterbrush
Bearded wheatgrass	Mountain-mahogany
Slender wheatgrass	Forb decreasers

The following plants are invaders, which come in if grazing is heavy:

All annuals	Dandelion
Canada bluegrass	Foxtail barley
Kentucky bluegrass	Rabbitbrushes
All other exotics	Meadow salsify
Curlycup gumweed	Sandworts
Broom snakeweed	Goatweed
Tumblegrass	Bullthistle

If you find that the percentage of any increaser actually is higher than the maximum in the climax vegetation according to table 9, use the percentage given in table 9. Add the percentages of the decreasers and the adjusted percentages of the increasers. If the result is more than 75, the range is in excellent condition; between 50 and 75, good condition; between 25 and 50, fair condition; and less than 25, poor condition.

From the stocking rates in table 8 you can figure the approximate number of animals that a given range will carry. Adjustments will need to be made for unusually wet or dry years. No more than half the annual growth should ever be grazed. If grazing is heavier, the range will deteriorate and the increasers will gain in number or vigor.

Range management.—To use range efficiently and bring it into maximum production, a rancher must adjust the following: (1) kind of livestock, (2) number of livestock, (3) season of use, and (4) distribution of grazing.

Kind of livestock.—Cattle do best on ranges that have a high proportion of grass in the plant cover; sheep generally do best on ranges that have a high proportion of browse and broad-leafed plants. Under a herding system, sheep can forage at greater distances from water than cattle.

Number of livestock.—The number of livestock to be grazed on the range should be decided according to the length of time that the range will be used and the amount of forage available. Some forage should be left on the ground to—

1. Mulch the soil and increase water-absorption and water-storage capacity. More soil moisture means more grass.
2. Permit deep, vigorous growth of grass roots. Enough green leaves should remain on each plant to provide food to be stored in the roots for early and

vigorous spring growth. Generally, about one-half of the leaves can be removed without damaging the plant's vigor and productivity.

3. Protect the soil from wind and water. A good grass cover will prevent erosion.

4. Allow the grass to crowd out weeds and other inferior plants. This will improve range condition.

5. Provide a feed reserve for periods of drought that might otherwise force sale of livestock at a time when prices are low.

Season of use.—The season during which a range can be used depends on the kinds of grasses on the range site and the elevation of the area. Grasses that grow well during cool weather generally furnish the earliest spring grazing and may also supply fall grazing. Warm-season grasses should be used during the summer months. Grass at high elevations may be available only during the summer, but grass at low elevations may be usable during spring and fall (fig. 4). Ranges that are in fair or poor condition should be grazed only late in fall or in winter until the climax vegetation has recovered. Ranges that are in good or excellent condition can also benefit from an occasional rest from grazing during the growing season of the primary forage species.

Distribution of grazing.—The distribution of grazing can be controlled by the location of water and salt, by fencing, and by herding.

Generally, water is required at about 1-mile intervals in rough country, but 2-mile intervals are suitable on more level range. Salt should be placed in lightly grazed areas where forage is abundant. Livestock do not require water and salt at the same location.

Fences are necessary to provide separate pastures for different classes of livestock and pastures for different seasons of use. Where possible, fences should be located on the boundary between two range sites, so that livestock will not overgraze the preferred range site while grazing the other site too lightly.

Herding is especially suitable for controlling the grazing of sheep. It is occasionally useful to keep cattle on the desired range sites at the proper seasons.

Forest-site index classes

A forest-site index is an estimate of the capacity of a particular soil landscape to produce trees under natural conditions. It is measured separately for each tree species, in terms of the estimated height that would be attained by an even-aged stand in 100 years. Thus, a forest-site index of 75 for ponderosa pine means that that particular soil and exposure, if dominated by an even-aged stand of ponderosa pine, can be expected to grow trees averaging 75 feet high in 100 years. A site index of 100 would indicate that the trees would reach an average height of 100 feet in 100 years.

The factors believed to be most important in determining the rate of growth are those that control the available moisture during the growing season. These are climate, topographic position, and characteristics of the soil profile, such as depth over bedrock or clean gravel, thickness and texture of the surface soil, thickness, texture, structure, and consistence of the subsoil, nature of the underlying substrata, and position of the water table.

Studies now in progress indicate that, for the more extensive soils of the forested parts of the Bitterroot

Figure 4.—**Cattle being moved from range on the Sula-Ravalli association on high benches to summer range in the Bitterroot National Forest. Photo by Ernst Peterson.**

Valley Area, the forest-site indexes for ponderosa pine range from 55 to 100. These soils have been grouped into forest-site index classes as follows:

Class 1.—Soils that have high capacity for supplying moisture to trees; forest-site indexes for ponderosa pine of 85 to 100.

Chamokane series (Ca, Cb, Cc, Cd, Ce).
Kenspur series (Ka).
Lick series, imperfectly drained variant (Lt, Lv, Lz, L2a).
Poverty series (Pd, Pe, Pf, Pg, Ph, Pk, Pl, Pm, Pn).

Class 2.—Soils that have medium capacity for supplying moisture to trees; forest-site indexes for ponderosa pine of 70 to 85.

Como coarse sandy loam phases (C2u, C2v, C2w, C2x).
Gorus series (G2f, G2g, G2h, G2k).
Lick series (Lo, Lp, Lr, Ls, Lu, Lw, Lx, Ly, L2b, L2c, L2d, L2e).
Woodside series (Wk, Wl, Wm, Wn, Wo, Wp, Wr, Ws, Wt, Wu, Wv, Ww, Wx).

Class 3.—Soils that have low capacity for supplying moisture to trees; forest-site indexes for ponderosa pine of 55 to 70.

Chereete series (Co, Cp, Cr, Cs, Cu, Ct, Cv, Cw, Cx, Cy, Cz, C2a, C2b).
Clark Fork series (C2c, C2d, C2e, C2f, C2g, C2h, C2k, C2l, C2m, C2n).

Class 4.—Soil associations that have a wide range in capacity for supplying moisture to trees; forest-site indexes for ponderosa pine of 60 to 100 (excluding rock outcrops).

Holloway association, mountainous (Hg).
Trapper association, mountainous (Tb).
Woodrock association, mountainous (Wh).

A forest-site index indicates the productivity of an unmanaged stand. By proper management of growing conditions, the rate of growth can be increased substantially. General management practices which may benefit are adequate fire protection, control of grazing, improvement cutting, and selective harvesting.

More detailed information and assistance in developing management for individual woodland areas may be obtained from the local offices of the United States Forest Service or the Soil Conservation Service or from the State Forester or the County Agent.

Estimated Yields

The productive capacity of a soil depends upon its own characteristics, its past and present management, and the common hazards, such as weather, crop diseases, and insects. Table 10 shows the yields that may be expected from the soils of the Bitterroot Valley Area under different levels of management. Estimates are given for yields to be expected under ordinary management, under intensive management, under special management for soils that have special requirements, and under dryland management for soils suited to dryland farming. For soils suited only to dryland farming or range, yields are given only for dryland management.

Ordinary management.—Ordinary management practices are those that were common during the period 1946 to 1951, when the survey was made. The figures in table 10 are estimated average yields obtained under all kinds of management and differing availabilities of irrigation water during that period.

Estimated yields of mixed hay are for native or rarely reseeded meadows that are naturally wet or that get plenty of irrigation water for the entire season.

Irrigated pasture under ordinary management may be either native pastures or former hayfields. It is amply irrigated throughout the season. Yields from irrigated pasture are given in cow-acre-days, that is, the number of days during a year that a cow can graze on one acre of the pasture without overgrazing or otherwise injuring the pasture. A yield of 100 cow-acre-days means that an acre of this pasture will support 1 cow for 100 days, or 4 cows for 25 days, or 10 cows for 10 days during the grazing season.

Intensive management.—Intensive management of irrigated crops includes the following practices: Furrow or flood irrigation, with plenty of water available during the entire growing season; systematic crop rotations in which legumes are grown and no crop is grown more than 3 consecutive years; applications of manure or green manure at least every 4 years; application of nitrogen and phosphorus fertilizers to sugar beets to supply the equivalent of 60 pounds of N and 60 pounds of P_2O_5 (if sugar beets are not in the crop rotation, 45 pounds of P_2O_5 is applied once every 4 years); and tillage by suitable methods and at the proper times.

Estimated yields of mixed hay are for meadows that are reseeded to suitable mixtures of legumes and grasses as soon as the stands begin to deteriorate. Hay may be part of a rotation. The meadows are naturally wet or else they receive plenty of irrigation water. Estimated yields from irrigated pastures are those that can be expected if the pastures are seeded to suitable mixtures of grass and legumes and irrigated as often and as much as necessary.

Table 10 gives estimates of average yields that can be obtained over a period of years if the intensive management practices are consistently applied. The high yields are those that can be expected in exceptionally good years or on the most productive parts of these soils in average years.

Special management.—Some soils require drainage, removal of stones, leaching of salt, or other special treatment. Others may erode if they are irrigated by ordinary methods, but they can safely be irrigated by sprinklers. Table 10 shows which soils will give higher yields under special management practices, and the footnotes show what type of special management is needed for each such soil. Table 10 gives estimates of average yields that can be obtained if appropriate special practices are consistently applied, and estimates of the high yields that can be expected in exceptionally good years, or on the most productive areas.

Dryland management.—Nonirrigated cropland is left fallow in alternate years. While it is fallow, it is tilled occasionally to control weeds. It must be tilled carefully, in order to reduce the danger of erosion. Table 10 gives estimated averages of yields obtained on the soils that are suitable for dryland farming.

TABLE 10.—*Estimated acre yields of selected crops under different levels of management*

[Absence of yield figures indicates that the crop is not suitable for the soil under the given level of management, or is not normally grown on the soil. Omission of a management level indicates that level is not considered practical for the particular soil]

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
Aa	Adel loam, level.														
	Ordinary	14	(2)	25	(2)	50	(2)	60	(2)	40	(2)	2.5	(2)	------	200
	Intensive	16	21	30	45	60	85	70	110	50	65	3.7	6.0	------	325
Ab	Adel loam, gently sloping.														
	Ordinary	14	(2)	25	(2)	50	(2)	60	(2)	40	(2)	2.5	(2)	------	200
	Intensive	16	21	30	45	60	85	70	110	50	65	3.7	6.0	------	325
Ac	Adel loam, sloping.														
	Ordinary	9	(2)	18	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	11	14	23	30	40	55	50	75	30	45	2.7	4.0	------	250
	Special [3]	13	17	25	35	45	65	50	85	35	50	2.8	4.5	------	------
Ad	Alluvial cobbly land, level.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	------	90
Ae	Alluvial cobbly land, gently sloping and sloping [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Af	Alluvial loamy land.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	------	90
Ag	Alluvial land and valley slopes [5]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Ah	Amsterdam silt loam, level.														
	Ordinary	14	(2)	30	(2)	55	(2)	65	(2)	45	(2)	3.0	(2)	------	225
	Intensive	17	22	35	50	65	100	75	120	55	75	4.0	6.5	------	------
Ak	Amsterdam silt loam, gently sloping.														
	Ordinary	------	------	25	(2)	50	(2)	60	(2)	40	(2)	2.5	(2)	------	200
	Intensive	------	------	30	45	60	85	70	110	50	65	3.7	6.0	------	325
	Special [3]	16	21	------	------	------	------	------	------	------	------	------	------	------	------
	Dryland	------	------	------	------	------	------	------	------	13	(2)	------	------	------	------
Al	Amsterdam silt loam, sloping.														
	Ordinary	------	------	20	(2)	40	(2)	50	(2)	30	(2)	2.2	(2)	------	180
	Intensive	------	------	25	35	50	75	60	90	40	55	3.2	5.0	------	275
	Special [3]	13	19	30	45	------	------	------	------	------	------	------	------	------	------
	Dryland	------	------	------	------	------	------	------	------	10	(2)	------	------	------	------
Am	Amsterdam silt loam, moderately steep and steep [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
An	Amsterdam-Haccke silt loams, gently sloping.														
	Ordinary	------	------	20	(2)	40	(2)	50	(2)	30	(2)	2.2	(2)	------	180
	Intensive	------	------	25	35	50	75	60	90	40	55	3.2	5.0	------	275
	Dryland	------	------	------	------	------	------	------	------	10	(2)	------	------	------	------
Ao	Amsterdam-Haccke silt loams, sloping.														
	Ordinary	------	------	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	------	------	25	35	45	65	55	85	35	50	2.8	4.5	------	250
Ap	Amsterdam-Haccke silt loams, strongly sloping.														
	Ordinary	------	------	------	------	20	(2)	30	(2)	15	(2)	1.2	(2)	------	90
	Intensive	------	------	------	------	32	45	37	50	22	35	1.9	3.0	------	120
	Special [3]	------	------	------	------	40	55	45	60	30	50	2.4	4.0	------	------
Bg	Bass coarse sandy loam, gently sloping.														
	Ordinary	------	------	15	(2)	25	(2)	35	(2)	20	(2)	------	------	1.7	160
	Intensive	11	14	21	27	40	55	50	75	30	45	------	------	2.7	250
Bh	Bass coarse sandy loam, sloping.														
	Ordinary	------	------	12	(2)	20	(2)	30	(2)	15	(2)	------	------	1.2	150
	Intensive	------	------	18	24	35	50	40	55	25	40	------	------	2.2	225
Bk	Bass coarse sandy loam, strongly sloping.														
	Ordinary	------	------	------	------	15	(2)	20	(2)	12	(2)	------	------	.8	60
	Intensive	------	------	------	------	25	35	30	40	17	27	------	------	1.4	80
Ba	Bass cobbly coarse sandy loam, gently sloping.														
	Ordinary	------	------	------	------	20	(2)	25	(2)	15	(2)	------	------	1.0	80
	Intensive	------	------	------	------	30	40	35	45	20	30	------	------	1.8	110

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
Bb	Bass cobbly coarse sandy loam, sloping.														
	Ordinary					20	(2)	25	(2)	15	(2)			1.0	80
	Intensive					30	40	35	45	20	30			1.8	110
Bc	Bass cobbly coarse sandy loam, strongly sloping.														
	Ordinary					12	(2)	15	(2)					.7	45
	Intensive					20	30	25	35					1.0	60
Bd	Bass gravelly coarse sandy loam, gently sloping.														
	Ordinary					20	(2)	25	(2)	15	(2)			1.0	80
	Intensive					30	40	35	45	20	30			1.8	110
Be	Bass gravelly coarse sandy loam, sloping.														
	Ordinary					20	(2)	25	(2)	15	(2)			1.0	80
	Intensive					30	40	35	45	20	30			1.8	110
Bf	Bass gravelly coarse sandy loam, strongly sloping.														
	Ordinary					12	(2)	15	(2)					.7	45
	Intensive					20	30	25	35					1.0	60
Bl	Bass-Ravalli loams, gently sloping.														
	Ordinary			15	(2)	25	(2)	35	(2)	20	(2)			1.7	160
	Intensive	11	14	21	27	40	55	50	75	30	45			2.7	250
Bm	Bass-Ravalli loams, sloping and strongly sloping.														
	Ordinary					15	(2)	20	(2)	12	(2)			.8	60
	Intensive					25	35	30	40	17	27			1.4	80
Bn	Bitterroot silt loam, level.														
	Ordinary	14	(2)	30	(2)	55	(2)	65	(2)	45	(2)	3.0	(2)		225
	Intensive	17	22	35	50	65	100	75	120	55	75	4.0	6.5		360
Bo	Bitterroot silt loam, gently sloping.														
	Ordinary			25	(2)	50	(2)	60	(2)	40	(2)	2.5	(2)		200
	Intensive			30	45	60	85	70	110	50	65	3.7	6.0		325
	Special [3]	16	21												
	Dryland									13	(2)				
Bp	Bitterroot silt loam, sloping.														
	Ordinary			20	(2)	40	(2)	50	(2)	30	(2)	2.2	(2)		180
	Intensive			25	35	50	75	60	90	40	55	3.2	5.0		275
	Special [3]	13	19	30	45										
	Dryland									10	(2)				
Br	Bitterroot silt loam, strongly sloping.														
	Ordinary					20	(2)	30	(2)	15	(2)	1.2	(2)		90
	Intensive					32	45	37	50	22	35	1.9	3.0		120
	Special [3]					40	55	45	60	30	50	2.4	4.0		
Bs	Bitterroot-Burnt Fork cobbly loams, gently sloping.														
	Ordinary			22	(2)	45	(2)	55	(2)	35	(2)	2.5	(2)		200
	Intensive			27	40	55	75	65	100	45	60	3.6	5.5		325
	Special [6]			30	45	60	85	70	110	50	65	3.7	6.0		
Bt	Bitterroot-Burnt Fork cobbly loams, sloping.														
	Ordinary			20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)		160
	Intensive			25	35	45	65	55	85	35	50	2.8	4.5		250
Bu	Bitterroot-Burnt Fork cobbly loams, strongly sloping.														
	Ordinary					20	(2)	30	(2)	15	(2)	1.2	(2)		90
	Intensive					32	45	37	50	22	35	1.9	3.0		120
	Special [3]					40	55	45	60	30	50	2.4	4.0		
Bv	Bitterroot, Wemple, and Ravalli soils, shallow, moderately steep and steep [4]														

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
B2c	Blodgett coarse sandy loam, gently sloping.														
	Ordinary	------	------	------	------	20	(2)	25	(2)	15	(2)	------	------	1.0	80
	Intensive	------	------	------	------	30	40	35	45	20	30	------	------	1.8	110
B2d	Blodgett coarse sandy loam, sloping.														
	Ordinary	------	------	------	------	20	(2)	25	(2)	15	(2)	------	------	1.0	80
	Intensive	------	------	------	------	30	40	35	45	20	30	------	------	1.8	110
B2e	Blodgett coarse sandy loam, strongly sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	------	------	.7	45
	Intensive	------	------	------	------	20	30	25	35	------	------	------	------	1.0	60
Bw	Blodgett cobbly coarse sandy loam, gently sloping.														
	Ordinary	------	------	------	------	15	(2)	20	(2)	12	(2)	------	------	.8	60
	Intensive	------	------	------	------	25	35	30	40	17	27	------	------	1.4	80
Bx	Blodgett cobbly coarse sandy loam, sloping.														
	Ordinary	------	------	------	------	15	(2)	20	(2)	12	(2)	------	------	.8	60
	Intensive	------	------	------	------	25	35	30	40	17	27	------	------	1.4	80
By	Blodgett cobbly coarse sandy loam, strongly sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	------	------	.7	45
	Intensive	------	------	------	------	20	30	25	35	------	------	------	------	1.0	60
Bz	Blodgett gravelly coarse sandy loam, gently sloping.														
	Ordinary	------	------	------	------	15	(2)	20	(2)	12	(2)	------	------	.8	60
	Intensive	------	------	------	------	25	35	30	40	17	27	------	------	1.4	80
B2a	Blodgett gravelly coarse sandy loam, sloping.														
	Ordinary	------	------	------	------	15	(2)	20	(2)	12	(2)	------	------	.8	60
	Intensive	------	------	------	------	25	35	30	40	17	27	------	------	1.4	80
B2b	Blodgett gravelly coarse sandy loam, strongly sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	------	------	.7	45
	Intensive	------	------	------	------	20	30	25	35	------	------	------	------	1.0	60
B2f	Blodgett, Bass, and Victor very stony soils [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
B2g	Blodgett and Bass soils, undifferentiated, moderately steep and steep [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
B2p	Breece loamy coarse sand, gently sloping.														
	Ordinary	9	(2)	18	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	11	14	23	30	40	55	50	75	30	45	2.7	4.0	------	250
	Special [3]	13	17	25	35	45	65	50	85	35	50	2.8	4.5	------	------
B2r	Breece loamy coarse sand, sloping.														
	Ordinary	9	(2)	18	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	11	14	23	30	40	55	50	75	30	45	2.7	4.0	------	250
	Special [3]	13	17	25	35	45	65	50	85	35	50	2.8	4.5	------	------
B2s	Breece loamy coarse sand, strongly sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	45
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	60
	Special [3]	------	------	------	------	25	35	30	40	------	------	2.0	3.0	------	------
B2h	Breece gravelly loamy coarse sand, gently sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	45
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	60
	Special [3]	------	------	------	------	25	35	30	40	------	------	2.0	3.0	------	------
B2k	Breece gravelly loamy coarse sand, sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	45
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	60
	Special [3]	------	------	------	------	25	35	30	40	------	------	2.0	3.0	------	------

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
B2l	Breece gravelly loamy coarse sand, strongly sloping[4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
B2m	Breece sandy loam, level.														
	Ordinary	14	(2)	25	(2)	50	(2)	60	(2)	40	(2)	2.5	(2)	------	200
	Intensive	16	21	30	45	60	85	70	110	50	65	3.7	6.0	------	325
B2n	Breece sandy loam, gently sloping.														
	Ordinary	14	(2)	25	(2)	50	(2)	60	(2)	40	(2)	2.5	(2)	------	200
	Intensive	16	21	30	45	60	85	70	110	50	65	3.7	6.0	------	325
B2o	Breece sandy loam, sloping.														
	Ordinary	9	(2)	18	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	11	14	23	30	40	55	50	75	30	45	2.7	4.0	------	250
	Special [3]	13	17	25	35	45	65	50	85	35	50	2.8	4.5	------	------
B2t	Brownlee-Duffy-Ravalli loams, sloping.														
	Dryland	------	------	------	------	------	------	------	------	11	(2)	------	------	------	------
B2u	Brownlee-Duffy-Ravalli loams, strongly sloping.														
	Dryland	------	------	------	------	------	------	------	------	11	(2)	------	------	------	------
B2v	Brownlee-Duffy-Ravalli loams, moderately steep[4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
B2w	Brownlee-Duffy-Ravalli loams, steep[4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
B2x	Brownlee-Stecum association, mountainous[4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
B3f	Burnt Fork loam, level.														
	Ordinary	14	(2)	30	(2)	55	(2)	65	(2)	45	(2)	3.0	(2)	------	225
	Intensive	17	22	35	50	65	100	75	120	55	75	4.0	6.5	------	360
B3g	Burnt Fork loam, gently sloping.														
	Ordinary	------	------	25	(2)	50	(2)	60	(2)	40	(2)	2.5	(2)	------	200
	Intensive	------	------	30	45	60	85	70	110	50	65	3.7	6.0	------	325
	Special [3]	16	21	------	------	------	------	------	------	------	------	------	------	------	------
	Dryland	------	------	------	------	------	------	------	------	13	(2)	------	------	------	------
B3h	Burnt Fork loam, sloping.														
	Ordinary	------	------	20	(2)	40	(2)	50	(2)	30	(2)	2.2	(2)	------	180
	Intensive	------	------	25	35	50	75	60	90	40	55	3.2	5.0	------	275
	Special [3]	13	19	30	45	------	------	------	------	------	------	------	------	------	------
	Dryland	------	------	------	------	------	------	------	------	10	(2)	------	------	------	------
B3k	Burnt Fork loam, strongly sloping.														
	Ordinary	------	------	------	------	20	(2)	30	(2)	15	(2)	1.2	(2)	------	90
	Intensive	------	------	------	------	32	45	37	50	22	35	1.9	3.0	------	120
	Special [3]	------	------	------	------	40	55	45	60	30	50	2.4	4.0	------	------
B2y	Burnt Fork cobbly loam, gently sloping.														
	Ordinary	------	------	22	(2)	45	(2)	55	(2)	35	(2)	2.5	(2)	------	200
	Intensive	------	------	27	40	55	75	65	100	45	60	3.6	5.5	------	325
	Special [6]	------	------	30	45	60	85	70	110	50	65	3.7	6.0	------	------
B2z	Burnt Fork cobbly loam, sloping.														
	Ordinary	------	------	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	------	------	25	35	45	65	55	85	35	50	2.8	4.5	------	250
B3a	Burnt Fork cobbly loam, strongly sloping.														
	Ordinary	------	------	------	------	20	(2)	30	(2)	15	(2)	1.2	(2)	------	90
	Intensive	------	------	------	------	32	45	37	50	22	35	1.9	3.0	------	120
	Special [3]	------	------	------	------	40	55	45	60	30	50	2.4	4.0	------	------
B3b	Burnt Fork gravelly loam, level.														
	Ordinary	------	------	22	(2)	45	(2)	55	(2)	35	(2)	2.5	(2)	------	200
	Intensive	------	------	27	40	55	75	65	100	45	60	3.6	5.5	------	325
	Special [6]	------	------	30	45	60	85	70	110	50	65	3.7	6.0	------	------
B3c	Burnt Fork gravelly loam, gently sloping.														
	Ordinary	------	------	22	(2)	45	(2)	55	(2)	35	(2)	2.5	(2)	------	200
	Intensive	------	------	27	40	55	75	65	100	45	60	3.6	5.5	------	325
	Special [6]	------	------	30	45	60	85	70	110	50	65	3.7	6.0	------	------

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
B3d	Burnt Fork gravelly loam, sloping.														
	Ordinary	------	------	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	------	------	25	35	45	65	55	85	35	50	2.8	4.5	------	250
B3e	Burnt Fork gravelly loam, strongly sloping.														
	Ordinary	------	------	------	------	20	(2)	30	(2)	15	(2)	1.2	(2)	------	90
	Intensive	------	------	------	------	32	45	37	50	22	35	1.9	3.0	------	120
	Special [3]	------	------	------	------	40	55	45	60	30	50	2.4	4.0	------	------
B3l	Burnt Fork very stony loam, gently sloping and sloping [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
B3m	Burnt Fork very stony loam, strongly sloping [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
B3n	Burnt Fork and Bitterroot soils, undifferentiated, moderately steep and steep [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
B3s	Burnt Fork-Ravalli loams, level.														
	Ordinary	------	------	20	(2)	40	(2)	50	(2)	30	(2)	2.2	(2)	------	180
	Intensive	------	------	25	35	50	75	60	90	40	55	3.2	5.0	------	275
	Dryland	------	------	------	------	------	------	------	------	10	(2)	------	------	------	------
B3t	Burnt Fork-Ravalli loams, gently sloping.														
	Ordinary	------	------	20	(2)	40	(2)	50	(2)	30	(2)	2.2	(2)	------	180
	Intensive	------	------	25	35	50	75	60	90	40	55	3.2	5.0	------	275
	Dryland	------	------	------	------	------	------	------	------	10	(2)	------	------	------	------
B3u	Burnt Fork-Ravalli loams, sloping.														
	Ordinary	------	------	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	------	------	25	35	45	65	55	85	35	50	2.8	4.5	------	250
B3v	Burnt Fork-Ravalli loams, strongly sloping.														
	Ordinary	------	------	------	------	20	(2)	30	(2)	15	(2)	1.2	(2)	------	90
	Intensive	------	------	------	------	32	45	37	50	22	35	1.9	3.0	------	120
	Special [3]	------	------	------	------	40	55	45	60	30	50	2.4	4.0	------	------
B3o	Burnt Fork-Ravalli cobbly loams, gently sloping.														
	Ordinary	------	------	15	(2)	25	(2)	35	(2)	20	(2)	1.5	(2)	------	150
	Intensive	------	------	21	27	40	55	50	75	30	45	2.3	4.0	------	225
B3p	Burnt Fork-Ravalli cobbly loams, sloping.														
	Ordinary	------	------	------	------	20	(2)	30	(2)	15	(2)	1.2	(2)	------	90
	Intensive	------	------	------	------	32	45	37	50	22	35	1.9	3.0	------	120
	Special [3]	------	------	------	------	40	55	45	60	30	50	2.4	4.0	------	------
B3r	Burnt Fork-Ravalli cobbly loams, strongly sloping.														
	Ordinary	------	------	------	------	20	(2)	30	(2)	15	(2)	1.2	(2)	------	90
	Intensive	------	------	------	------	32	45	37	50	22	35	1.9	3.0	------	120
	Special [3]	------	------	------	------	40	55	45	60	30	50	2.4	4.0	------	------
B3w	Burnt Fork-Ravalli loams, arkosic variants, gently sloping.														
	Ordinary	------	------	20	(2)	40	(2)	50	(2)	30	(2)	2.2	(2)	------	180
	Intensive	------	------	25	35	50	75	60	90	40	55	3.2	5.0	------	275
	Dryland	------	------	------	------	------	------	------	------	10	(2)	------	------	------	------
B3x	Burnt Fork-Ravalli loams, arkosic variants, sloping.														
	Ordinary	------	------	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	------	------	25	35	45	65	55	85	35	50	2.8	4.5	------	250
B3y	Burnt Fork-Ravalli loams, arkosic variants, strongly sloping.														
	Ordinary	------	------	------	------	20	(2)	30	(2)	15	(2)	1.2	(2)	------	90
	Intensive	------	------	------	------	32	45	37	50	22	35	1.9	3.0	------	120
	Special [3]	------	------	------	------	40	55	45	60	30	50	2.4	4.0	------	------

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
B3z	Burnt Fork and Riverside loams, imperfectly drained (seeped), level and gently sloping.														
	Ordinary														90
B4a	Burnt Fork and Riverside loams, imperfectly drained (seeped), sloping and strongly sloping.														
	Ordinary														90
B4b	Burnt Fork and Riverside loams, imperfectly drained (seeped), moderately steep.														
	Ordinary														90
Cm	Castner stony loam, sloping and strongly sloping[4]														
Cn	Castner stony loam, moderately steep and steep[4]														
Cb	Chamokane fine sandy loam.														
	Ordinary	8	(2)			20	(2)	30	(2)	15	(2)	1.5	(2)		150
	Intensive	11	14			35	50	40	55	25	40	2.2	4.0		225
	Special [3]	12	15			40	55	45	60	30	50	2.4	4.0		
Cc	Chamokane gravelly loamy sand, shallow[4]														
Cd	Chamokane loamy fine sand.														
	Ordinary	6	(2)			15	(2)	20	(2)	12	(2)	1.0	(2)	.8	60
	Intensive	8	10			25	35	30	40	17	27	1.4	2.5	1.4	80
	Special [3]					30	40	35	45	20	30	2.4	3.8		
Ce	Chamokane loamy sand-sandy loam, shallow.														
	Ordinary	6	(2)			15	(2)	20	(2)	12	(2)	1.0	(2)	.8	60
	Intensive	8	10			25	35	30	40	17	27	1.4	2.5	1.4	80
	Special [3]					30	40	35	45	20	30	2.4	3.8		
Ca	Chamokane complex [4]														
Cf	Charlos loam, gently sloping.														
	Ordinary			15	(2)	25	(2)	35	(2)	20	(2)			1.7	160
	Intensive	11	14	21	27	40	55	50	75	30	45			2.7	250
Cg	Charlos loam, sloping.														
	Ordinary			12	(2)	20	(2)	30	(2)	15	(2)			1.2	150
	Intensive			18	24	35	50	40	55	25	40			2.2	225
Ch	Charlos loam, strongly sloping.														
	Ordinary					15	(2)	20	(2)	12	(2)			.8	60
	Intensive					25	35	30	40	17	27			1.4	80
Ck	Charlos silt loam, level.														
	Ordinary			15	(2)	25	(2)	35	(2)	20	(2)			1.7	160
	Intensive	11	14	21	27	40	55	50	75	30	45			2.7	250
Cl	Charlos silt loam, gently sloping.														
	Ordinary			15	(2)	25	(2)	35	(2)	20	(2)			1.7	160
	Intensive	11	14	21	27	40	55	50	75	30	45			2.7	250
Cw	Chereete stony coarse sandy loam, level[4]														
Cx	Chereete stony coarse sandy loam, gently sloping[4]														
Cy	Chereete stony coarse sandy loam, sloping[4]														
Cz	Chereete very stony coarse sandy loam, level[4]														
C2a	Chereete very stony coarse sandy loam, gently sloping[4]														
C2b	Chereete very stony coarse sandy loam, sloping[4]														

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days*[1]
Co	Chereete gravelly coarse sandy loam, level[4]														
Cp	Chereete gravelly coarse sandy loam, gently sloping[4]														
Cr	Chereete gravelly coarse sandy loam, sloping[4]														
Cs and Cu	Chereete sandy loam, level.														
	Ordinary					12	(2)	15	(2)					.7	45
	Intensive					20	30	25	35					1.0	60
	Special [3]					25	35	30	40						
Ct and Cv	Chereete sandy loam, gently sloping.														
	Ordinary					12	(2)	15	(2)					.7	45
	Intensive					20	30	25	35					1.0	60
	Special [3]					25	35	30	40						
C2f	Clark Fork fine sandy loam, level.														
	Ordinary					12	(2)	15	(2)					.7	45
	Intensive					20	30	25	35					1.0	60
	Special [3]					25	35	30	40						
C2g	Clark Fork fine sandy loam, gently sloping.														
	Ordinary					12	(2)	15	(2)					.7	45
	Intensive					20	30	25	35					1.0	60
	Special [3]					25	35	30	40						
C2h	Clark Fork gravelly fine sandy loam, level.														
	Ordinary					12	(2)	15	(2)					.7	45
	Intensive					20	30	25	35					1.0	60
	Special [3]					25	35	30	40						
C2c	Clark Fork cobbly sandy loam, level[4]														
C2d	Clark Fork cobbly sandy loam, gently sloping[4]														
C2e	Clark Fork cobbly sandy loam, sloping[4]														
C2m	Clark Fork very stony sandy loam, gently sloping and sloping[4]														
C2n	Clark Fork very stony sandy loam, strongly sloping[4]														
C2k	Clark Fork loam, level.														
	Ordinary					15	(2)	20	(2)	12	(2)			.8	60
	Intensive					25	35	30	40	17	27			1.4	80
C2l	Clark Fork loam, gently sloping.														
	Ordinary					15	(2)	20	(2)	12	(2)			.8	60
	Intensive					25	35	30	40	17	27			1.4	80
C2o	Como gravelly coarse sandy loam, gently sloping.														
	Ordinary					12	(2)	15	(2)					.7	45
	Intensive					20	30	25	35					1.0	60
	Special [3]					25	35	30	40						
C2p	Como gravelly coarse sandy loam, sloping.														
	Ordinary					12	(2)	15	(2)					.7	45
	Intensive					20	30	25	35					1.0	60
	Special [3]					25	35	30	40						
C2r	Como gravelly coarse sandy loam, strongly sloping[4]														
C2s	Como gravelly coarse sandy loam, moderately steep[4]														
C2t	Como gravelly coarse sandy loam, steep[4]														

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
C2u	Como coarse sandy loam, gently sloping.														
	Ordinary	--	--	--	--	12	(2)	15	(2)	--	--	--	--	.7	45
	Intensive	--	--	--	--	20	30	25	35	--	--	--	--	1.0	60
	Special [3]	--	--	--	--	25	35	30	40	--	--	--	--	--	--
C2v	Como coarse sandy loam, sloping.														
	Ordinary	--	--	--	--	12	(2)	15	(2)	--	--	--	--	.7	45
	Intensive	--	--	--	--	20	30	25	35	--	--	--	--	1.0	60
	Special [3]	--	--	--	--	25	35	30	40	--	--	--	--	--	--
C2w	Como coarse sandy loam, strongly sloping [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2x	Como coarse sandy loam, moderately steep [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2y	Como stony coarse sandy loam, gently sloping [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2z	Como stony coarse sandy loam, sloping [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3a	Como stony coarse sandy loam, strongly sloping [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3b	Como stony coarse sandy loam, moderately steep [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3c	Como stony and very stony coarse sandy loams, gently sloping [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3d	Como stony and very stony coarse sandy loams, sloping [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3e	Como stony and very stony coarse sandy loams, strongly sloping. [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3f	Como stony and very stony coarse sandy loams, moderately steep [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3g	Como stony and very stony coarse sandy loams, steep [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3h	Cooney loam, sloping.														
	Ordinary	--	--	--	--	20	(2)	30	(2)	15	(2)	1.2	(2)	--	90
	Intensive	--	--	--	--	32	45	37	50	22	35	1.9	3.0	--	120
	Special [3]	--	--	--	--	40	55	45	60	30	50	2.4	4.0	--	--
C3k	Cooney loam, strongly sloping.														
	Ordinary	--	--	--	--	20	(2)	30	(2)	15	(2)	1.2	(2)	--	90
	Intensive	--	--	--	--	32	45	37	50	22	35	1.9	3.0	--	120
	Special [3]	--	--	--	--	40	55	45	60	30	50	2.4	4.0	--	--
C3l	Cooney loam, moderately steep [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3m	Cooney-Haccke silt loams, sloping.														
	Ordinary	--	--	--	--	12	(2)	15	(2)	--	--	.8	(2)	--	60
	Intensive	--	--	--	--	20	30	25	35	--	--	1.0	2.0	--	80
C3n	Cooney-Haccke silt loams, strongly sloping.														
	Ordinary	--	--	--	--	12	(2)	15	(2)	--	--	.8	(2)	--	60
	Intensive	--	--	--	--	20	30	25	35	--	--	1.0	2.0	--	80
C3o	Cooney-Haccke silt loams, moderately steep [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3p	Corvallis silt loam.														
	Ordinary	14	(2)	--	--	50	(2)	65	(2)	40	(2)	2.5	(2)	--	225
	Intensive	16	22	--	--	60	85	75	120	50	65	3.7	6.0	--	360
	Special [7]	--	--	35	50	65	100	--	--	55	75	4.0	6.5	--	--
C3r	Corvallis silt loam, poorly drained variant.														
	Ordinary	--	--	--	--	--	--	--	--	--	--	--	--	1.0	160
	Intensive	--	--	--	--	--	--	--	--	--	--	--	--	1.7	--

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
C3s	Corvallis silt loam, slightly saline.														
	Ordinary	11	(2)	------	------	30	(2)	40	(2)	23	(2)	2.0	(2)	------	200
	Intensive	13	18	------	------	45	65	60	90	40	55	3.2	5.0	------	300
	Special [8]	16	22	35	40	60	85	75	120	55	75	7.0	6.5	------	------
C3t	Corvallis silt loam, moderately saline.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	.8	90
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	1.3	120
C3u	Corvallis silt loam, cobbly subsoil.														
	Ordinary	------	------	------	------	20	(2)	35	(2)	15	(2)	------	------	1.7	200
	Intensive	------	------	------	------	35	50	50	75	25	35	------	------	2.7	300
	Special [7]	16	22	------	------	60	85	75	120	55	75	4.0	6.5	------	------
C3v	Corvallis silt loam, moderately shallow, slightly saline.														
	Ordinary	9	(2)	------	------	25	(2)	40	(2)	20	(2)	1.7	(2)	------	160
	Intensive	12	16	------	------	35	50	50	75	25	35	2.6	3.7	------	250
De	Dominic very cobbly sandy loam, level.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	.8	90
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	1.3	------
Df	Dominic very cobbly sandy loam, gently sloping.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	.8	90
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	1.3	------
Da	Dominic cobbly loam, level.														
	Ordinary	------	------	------	------	20	(2)	30	(2)	15	(2)	1.2	(2)	.7	90
	Intensive	------	------	------	------	32	45	37	50	22	35	1.9	3.0	1.3	120
	Special [3]	------	------	------	------	40	55	45	60	30	50	2.4	4.0	------	------
Db	Dominic cobbly loam, gently sloping.														
	Ordinary	------	------	------	------	20	(2)	30	(2)	15	(2)	1.2	(2)	.7	90
	Intensive	------	------	------	------	32	45	37	50	22	35	1.9	3.0	1.3	120
	Special [3]	------	------	------	------	40	55	45	60	30	50	2.4	4.0	------	------
Dc	Dominic gravelly loamy sand, level.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	.8	90
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	1.3	------
Dd	Dominic gravelly loamy sand, gently sloping.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	.8	90
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	1.3	------
Gf	Gallatin silty clay loam, level.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	1.5	180
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	2.5	------
Ga	Gallatin loam, drained, level.														
	Ordinary	14	(2)	------	------	50	(2)	65	(2)	40	(2)	2.5	(2)	------	225
	Intensive	16	22	------	------	60	85	75	120	50	65	3.7	6.0	------	360
	Special [7]	------	------	35	50	65	100	------	------	55	75	4.0	6.5	------	------
Gb	Gallatin loam, drained, gently sloping.														
	Ordinary	14	(2)	------	------	50	(2)	65	(2)	40	(2)	2.5	(2)	------	225
	Intensive	16	22	------	------	60	85	75	120	50	65	3.7	6.0	------	360
	Special [7]	------	------	35	50	65	100	------	------	55	75	4.0	6.5	------	------
Gc	Gallatin loam-gravelly loam, level.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	1.5	180
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	2.5	------
Gd	Gallatin silt loam, level.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	1.5	180
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	2.5	------
Ge	Gallatin silt loam, gently sloping.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	1.5	180
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	2.5	------

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days*[1]
Gh	Gallatin-shallow muck complex, level.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	1.0	160
	Intensive	----	----	----	----	----	----	----	----	----	----	----	----	1.7	----
Gk	Gallatin-shallow muck complex, gently sloping.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	1.0	160
	Intensive	----	----	----	----	----	----	----	----	----	----	----	----	1.7	----
Go	Gird silt loam, sloping.														
	Dryland	----	----	----	----	----	----	----	----	17	(2)	----	----	----	----
Gp	Gird silt loam, strongly sloping.														
	Dryland	----	----	----	----	----	----	----	----	17	(2)	----	----	----	----
Gr	Gird silt loam, moderately steep[4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Gs	Gird silt loam, steep[4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Gt	Gird silt loam, high lime subsoil variant, gently sloping.														
	Dryland	----	----	----	----	----	----	----	----	17	(2)	----	----	----	----
Gu	Gird silt loam, high lime subsoil variant, sloping.														
	Dryland	----	----	----	----	----	----	----	----	17	(2)	----	----	----	----
Gv	Gird silt loam, high lime subsoil variant, strongly sloping.														
	Dryland	----	----	----	----	----	----	----	----	17	(2)	----	----	----	----
Gw	Gird silt loam, high lime subsoil variant, moderately steep[4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Gx	Gird silt loam, high lime subsoil variant, steep[4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Gl	Gird fine sandy loam, sandy subsoil variant, gently soping.														
	Drylalnd	----	----	----	----	----	----	----	----	13	(2)	----	----	----	----
Gm	Gird fine sandy loam, sandy subsoil variant, strongly sloping.														
	Dryland	----	----	----	----	----	----	----	----	13	(2)	----	----	----	----
Gn	Gird fine sandy loam, sandy subsoil variant, moderately steep and steep[4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Gy	Gird-Haccke silt loams, sloping.														
	Dryland	----	----	----	----	----	----	----	----	13	(2)	----	----	----	----
Gz	Gird-Haccke silt loams, strongly sloping.														
	Dryland	----	----	----	----	----	----	----	----	13	(2)	----	----		
G2a	Gird-Haccke silt loams, moderately steep[4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
G2b	Gird-Haccke silt loams, steep[4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
G2c	Gird - Teton - Haccke loams, strongly sloping.														
	Dryland	----	----	----	----	----	----	----	----	13	(2)	----	----	----	----
G2d	Gird - Teton - Haccke loams, moderately steep[4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
G2e	Gird - Teton - Haccke loams, steep[4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
G2f	Gorus silt loam, gently sloping.														
	Ordinary	----	----	----	----	15	(2)	20	(2)	12	(2)	----	----	.8	60
	Intensive	----	----	----	----	25	35	30	40	17	27	----	----	1.4	80
G2g	Gorus silt loam, sloping.														
	Ordinary	----	----	----	----	15	(2)	20	(2)	12	(2)	----	----	.8	60
	Intensive	----	----	----	----	25	35	30	40	17	27	----	----	1.4	80

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
G2h	Gorus silt loam, strongly sloping [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
G2k	Gorus silt loam, moderately steep [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
G2n	Grantsdale loam, level.														
	Ordinary	14	(2)	25	(2)	50	(2)	60	(2)	40	(2)	2.5	(2)	------	200
	Intensive	16	21	30	45	60	85	70	110	50	65	3.7	6.0	------	325
G2o	Grantsdale loam, gently sloping.														
	Ordinary	14	(2)	25	(2)	50	(2)	60	(2)	40	(2)	2.5	(2)	------	200
	Intensive	16	21	30	45	60	85	70	110	50	65	3.7	6.0	------	325
G2l	Grantsdale cobbly loam, imperfectly drained variant, level.														
	Ordinary	9	(2)	------	------	25	(2)	40	(2)	20	(2)	1.7	(2)	------	160
	Intensive	12	16	------	------	35	50	50	75	25	35	2.6	3.7	------	250
G2m	Grantsdale cobbly loam, imperfectly drained variant, slightly saline, level.														
	Ordinary	6	(2)	------	------	18	(2)	25	(2)	12	(2)	1.1	(2)	------	150
	Intensive	8	10	------	------	25	35	35	45	17	27	1.9	3.0	------	225
	Special [8]	12	14	------	------	35	45	40	55	25	35	2.4	4.0	------	------
G2p	Grantsdale loam, shallow, and Dominic sandy loam, level.														
	Ordinary	9	(2)	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	12	15	25	35	45	65	55	85	35	50	2.8	4.5	------	250
G2r	Grantsdale loam, shallow, and Dominic sandy loam, gently sloping.														
	Ordinary	9	(2)	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	12	15	25	35	45	65	55	85	35	50	2.8	4.5	------	250
G2u	Grantsdale and Dominic soils, very shallow, strongly sloping [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
G2s	Grantsdale-Dominic cobbly loams, level.														
	Ordinary	------	------	17	(2)	25	(2)	35	(2)	20	(2)	1.9	(2)	------	150
	Intensive	------	------	21	27	35	50	45	60	25	35	2.6	3.7	------	235
	Special [3]	------	------	25	35	45	65	50	85	35	50	2.8	4.5	------	------
G2t	Grantsdale-Dominic cobbly loams, gently sloping.														
	Ordinary	------	------	17	(2)	25	(2)	35	(2)	20	(2)	1.9	(2)	------	150
	Intensive	------	------	21	27	35	50	45	60	25	35	2.6	3.7	------	235
	Special [3]	------	------	25	35	45	65	50	85	35	50	2.8	4.5	------	------
G2v	Gravel pits and dumps [9]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
G2w	Greeley sandy loam, level.														
	Ordinary	10	(2)	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	13	18	25	35	50	75	60	90	40	55	3.2	5.0	------	250
	Special [3]	15	20	------	------	------	------	------	------	------	------	------	------	------	------
G2x	Greeley sandy loam, gently sloping.														
	Ordinary	9	(2)	18	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	11	14	23	30	40	55	50	75	30	45	2.7	4.0	------	250
	Special [3]	13	17	25	35	45	65	50	85	35	50	2.8	4.5	------	------
G2y	Greeley sandy loam, sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	45
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	60
	Special [3]	------	------	------	------	25	35	30	40	------	------	2.0	3.0	------	------
Hc	Hamilton silt loam, level.														
	Ordinary	16	(2)	30	(2)	55	(2)	65	(2)	45	(2)	4.0	(2)	------	225
	Intensive	18	22	35	50	65	100	75	120	55	75	4.5	6.5	------	360
Hd	Hamilton silt loam, gently sloping.														
	Ordinary	15	(2)	30	(2)	55	(2)	65	(2)	45	(2)	3.0	(2)	------	225
	Intensive	17	22	35	50	65	100	75	120	55	75	4.0	6.5	------	360

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
Ha	Hamilton fine sandy loam, level.														
	Ordinary	15	(2)	30	(2)	55	(2)	65	(2)	45	(2)	3.0	(2)	---	225
	Intensive	17	22	35	50	65	100	75	120	55	75	4.0	6.5	---	360
Hb	Hamilton fine sandy loam, gently sloping.														
	Ordinary	15	(2)	30	(2)	55	(2)	65	(2)	45	(2)	3.0	(2)	---	225
	Intensive	17	22	35	50	65	100	75	120	55	75	4.0	6.5	---	360
He	Hamilton-Corvallis sandy loams, level.														
	Ordinary	16	(2)	30	(2)	55	(2)	65	(2)	45	(2)	4.0	(2)	---	225
	Intensive	18	22	35	50	65	100	75	120	55	75	4.5	6.5	---	360
Hf	Hamilton-Corvallis silt loams, level.														
	Ordinary	16	(2)	30	(2)	55	(2)	65	(2)	45	(2)	4.0	(2)	---	225
	Intensive	18	22	35	50	65	100	75	120	55	75	4.5	6.5	---	360
Hg	Holloway association, mountainous [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ka	Kenspur fine sandy loam.														
	Ordinary	10	(2)	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	---	160
	Intensive	13	18	25	35	50	75	60	90	40	55	3.2	5.0	---	250
	Special [3]	15	20	---	---	---	---	---	---	---	---	---	---	---	---
La	Laporte stony loam, sloping and strongly sloping [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Lb	Laporte stony loam, moderately steep and steep [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Lc	Larry clay loam, level.														
	Ordinary	---	---	---	---	---	---	---	---	---	---	---	---	1.5	180
	Intensive	---	---	---	---	---	---	---	---	---	---	---	---	2.5	---
Ld	Larry clay loam, drained, level.														
	Ordinary	---	---			25	(2)	35	(2)	20	(2)			1.7	160
	Intensive	11	14	---	---	40	55	50	75	30	45	---	---	2.7	250
Le	Larry clay loam, drained, gently sloping.														
	Ordinary	---	---			25	(2)	35	(2)	20	(2)			1.7	160
	Intensive	11	14	---	---	40	55	50	75	30	45	---	---	2.7	250
Lf	Larry clay loam, gently sloping.														
	Ordinary	---	---	---	---	---	---	---	---	---	---	---	---	1.5	180
	Intensive	---	---	---	---	---	---	---	---	---	---	---	---	2.5	---
Lg	Larry clay loam, sloping.														
	Ordinary	---	---	---	---	---	---	---	---	---	---	---	---	.8	100
	Intensive	---	---	---	---	---	---	---	---	---	---	---	---	1.3	---
Lh	Larry silt loam, level.														
	Ordinary	---	---	---	---	---	---	---	---	---	---	---	---	1.5	180
	Intensive	---	---	---	---	---	---	---	---	---	---	---	---	2.5	---
Lk	Larry silt loam, drained, level.														
	Ordinary	---	---			25	(2)	35	(2)	20	(2)			1.7	160
	Intensive	11	14	---	---	40	55	50	75	30	45	---	---	2.7	250
Ll	Larry silt loam, gently sloping.														
	Ordinary	---	---	---	---	---	---	---	---	---	---	---	---	1.5	180
	Intensive	---	---	---	---	---	---	---	---	---	---	---	---	2.5	---
Lm	Larry silt loam, drained, gently sloping.														
	Ordinary	---	---			25	(2)	35	(2)	20	(2)			1.7	160
	Intensive	11	14	---	---	40	55	50	75	30	45	---	---	2.7	250
Ln	Larry silt loam, sloping.														
	Ordinary	---	---	---	---	---	---	---	---	---	---	---	---	.8	100
	Intensive	---	---	---	---	---	---	---	---	---	---	---	---	1.3	---
Lu	Lick loam, gently sloping.														
	Ordinary	---	---	---	---	15	(2)	20	(2)	12	(2)	---	---	.8	60
	Intensive	---	---	---	---	25	35	30	40	17	27	---	---	1.4	80
Lw	Lick loam, sloping.														
	Ordinary	---	---	---	---	15	(2)	20	(2)	12	(2)	---	---	.8	60
	Intensive	---	---	---	---	25	35	30	40	17	27	---	---	1.4	80
Lx	Lick loam, strongly sloping [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
Ly	Lick loam, moderately steep [4]														
Lo	Lick gravelly loam, gently sloping.														
	Ordinary					15	(2)	20	(2)	12	(2)			.8	60
	Intensive					25	35	30	40	17	27			1.4	80
Lp	Lick gravelly loam, sloping.														
	Ordinary					15	(2)	20	(2)	12	(2)			.8	60
	Intensive					25	35	30	40	17	27			1.4	80
Lr	Lick gravelly loam, strongly sloping [4]														
Ls	Lick gravelly loam, moderately steep [4]														
L2b	Lick stony loam, sloping [4]														
L2c	Lick stony loam, strongly sloping [4]														
L2d	Lick stony loam, moderately steep [4]														
L2e	Lick stony loam, steep [4]														
Lt	Lick loam, imperfectly drained variant, level.														
	Ordinary													.8	100
	Intensive													1.3	
Lv	Lick loam, imperfectly drained variant, gently sloping.														
	Ordinary													.8	100
	Intensive													1.3	
Lz	Lick loam, imperfectly drained variant, sloping.														
	Ordinary													.8	100
	Intensive													1.3	
L2a	Lick loam, imperfectly drained variant, strongly sloping.														
	Ordinary													.8	100
	Intensive													1.3	
L2g	Lolo gravelly loam, level.														
	Ordinary			22	(2)	45	(2)	55	(2)	35	(2)	2.5	(2)		200
	Intensive			27	40	55	75	65	100	45	60	3.6	5.5		325
L2h	Lolo gravelly loam, gently sloping.														
	Ordinary			17	(2)	25	(2)	35	(2)	20	(2)	1.9	(2)		150
	Intensive			21	27	35	50	45	60	25	35	2.6	3.7		235
	Special [3]			25	35	45	65	50	85	35	50	2.8	4.5		
L2f	Lolo cobbly loam, gently sloping.														
	Ordinary			17	(2)	25	(2)	35	(2)	20	(2)	1.9	(2)		150
	Intensive			21	27	35	50	45	60	25	35	2.6	3.7		235
	Special [3]			25	35	45	65	50	85	35	50	2.8	4.5		
L2m	Lone Rock coarse sandy loam, level.														
	Ordinary	6	(2)	12	(2)	20	(2)	25	(2)	15	(2)	1.1	(2)		80
	Intensive	8	10	15	20	30	40	35	45	20	30	1.9	3.0		110
	Special [3]	12	14	20	25	35	45	40	55	25	35	2.4	4.0		
L2n	Lone Rock coarse sandy loam, gently sloping.														
	Ordinary	6	(2)	12	(2)	20	(2)	25	(2)	15	(2)	1.1	(2)		80
	Intensive	8	10	15	20	30	40	35	45	20	30	1.9	3.0		110
	Special [3]	12	14	20	25	35	45	40	55	25	35	2.4	4.0		
L2o	Lone Rock coarse sandy loam, sloping.														
	Ordinary					12	(2)	15	(2)			.8	(2)		45
	Intensive					20	30	25	35			1.0	2.0		60
	Special [3]					25	35	30	40			2.0	3.0		
L2k	Lone Rock cobbly coarse sandy loam, level.														
	Ordinary	6	(2)	12	(2)	20	(2)	25	(2)	15	(2)	1.1	(2)		80
	Intensive	8	10	15	20	30	40	35	45	20	30	1.9	3.0		110
	Special [3]	12	14	20	25	35	45	40	55	25	35	2.4	4.0		

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
L2l	Lone Rock fine sandy loam, dark colored variant, level.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	.7	[2]	.8	60
	Intensive	----	----	----	----	----	----	----	----	----	----	1.4	2.5	1.4	80
Ma	Maiden-Gird silt loams, gently sloping.														
	Dryland	----	----	----	----	----	----	----	----	13	[2]	----	----	----	----
Mb	Maiden-Gird silt loams, sloping.														
	Dryland	----	----	----	----	----	----	----	----	13	[2]	----	----	----	----
Mc	Maiden-Gird silt loams, strongly sloping.														
	Dryland	----	----	----	----	----	----	----	----	13	[2]	----	----	----	----
Md	Maiden-Gird silt loams, moderately steep [4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pa	Peat.														
	Ordinary (undrained)	----	----	----	----	----	----	----	----	----	----	----	----	----	90
	Ordinary (drained)	----	----	----	----	----	----	----	----	----	----	----	----	1.5	180
	Intensive (drained)	----	----	----	----	----	----	----	----	----	----	----	----	2.5	----
Pb	Peat, shallow over silt.														
	Ordinary (undrained)	----	----	----	----	----	----	----	----	----	----	----	----	----	90
	Ordinary (drained)	----	----	----	----	----	----	----	----	----	----	----	----	1.5	180
	Intensive (drained)	----	----	----	----	----	----	----	----	----	----	----	----	2.5	----
Pc	Peat, shallow over gravel.														
	Ordinary (undrained)	----	----	----	----	----	----	----	----	----	----	----	----	----	90
	Ordinary (drained)	----	----	----	----	----	----	----	----	----	----	----	----	1.5	180
	Intensive (drained)	----	----	----	----	----	----	----	----	----	----	----	----	2.5	----
Pd	Poverty cobbly loam, level.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	.8	100
	Intensive	----	----	----	----	----	----	----	----	----	----	----	----	1.3	----
Pe	Poverty cobbly loam, gently sloping.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	.8	100
	Intensive	----	----	----	----	----	----	----	----	----	----	----	----	1.3	----
Pf	Poverty cobbly loam, sloping.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	.8	100
	Intensive	----	----	----	----	----	----	----	----	----	----	----	----	1.3	----
Pg	Poverty loam, gently sloping.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	.8	100
	Intensive	----	----	----	----	----	----	----	----	----	----	----	----	1.3	----
Ph	Poverty coarse sandy loam, level.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	.8	100
	Intensive	----	----	----	----	----	----	----	----	----	----	----	----	1.3	----
Pk	Poverty coarse sandy loam, gently sloping.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	.8	100
	Intensive	----	----	----	----	----	----	----	----	----	----	----	----	1.3	----
Pl	Poverty coarse sandy loam, sloping.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	.8	100
	Intensive	----	----	----	----	----	----	----	----	----	----	----	----	1.3	----
Pm	Poverty very stony coarse sandy loam, gently sloping.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	.8	100
	Intensive	----	----	----	----	----	----	----	----	----	----	----	----	1.3	----
Pn	Poverty very stony coarse sandy loam, sloping.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	.8	100
	Intensive	----	----	----	----	----	----	----	----	----	----	----	----	1.3	----
Ra	Ravalli-Bitterroot cobbly loams, shallow, gently sloping [4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Rb	Ravalli-Bitterroot cobbly loams, shallow, sloping [4]	----	----	----	----	----	----	----	----	----	----	----	----	----	----

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
Rc	Ravalli-Bitterroot cobbly loams, shallow, strongly sloping [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Rd	Ravalli-Bitterroot loams, shallow, gently sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	60
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	80
Re	Ravalli-Bitterroot loams, shallow, sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	60
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	80
Rf	Ravalli-Bitterroot loams, shallow, strongly sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	60
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	80
Rk	Riverside cobbly sandy loam, gently sloping.														
	Ordinary	------	------	------	------	15	(2)	20	(2)	12	(2)	1.0	(2)	------	60
	Intensive	------	------	------	------	25	35	30	40	17	27	1.4	2.5	------	80
	Special [3,6]	------	------	------	------	30	40	35	45	20	30	2.4	3.8	------	------
Rl	Riverside cobbly sandy loam, sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	45
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	60
	Special [3]	------	------	------	------	25	35	30	40	------	------	2.0	3.0	------	------
Rr	Riverside gravelly sandy loam, gently sloping.														
	Ordinary	------	------	------	------	15	(2)	20	(2)	12	(2)	1.0	(2)	------	60
	Intensive	------	------	------	------	25	35	30	40	17	27	1.4	2.5	------	80
	Special [3,6]	------	------	------	------	30	40	35	45	20	30	2.4	3.8	------	------
Rs	Riverside gravelly sandy loam, sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	45
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	60
	Special [3]	------	------	------	------	25	35	30	40	------	------	2.0	3.0	------	------
Rp	Riverside gravelly and cobbly sandy loams, strongly sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	45
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	60
	Special [3]	------	------	------	------	25	35	30	40	------	------	2.0	3.0	------	------
Rm	Riverside fine sandy loam, gently sloping.														
	Ordinary	6	(2)	12	(2)	20	(2)	25	(2)	15	(2)	1.1	(2)	------	80
	Intensive	8	10	15	20	30	40	35	45	20	30	1.9	3.0	------	110
	Special [3]	12	14	20	25	35	45	40	55	25	35	2.4	4.0	------	------
Rn	Riverside fine sandy loam, sloping.														
	Ordinary	------	------	------	------	15	(2)	20	(2)	12	(2)	1.0	(2)	------	60
	Intensive	------	------	------	------	25	35	30	40	17	27	1.4	2.5	------	80
	Special [3,6]	------	------	------	------	30	40	35	45	20	30	2.4	3.8	------	------
Ro	Riverside fine sandy loam, strongly sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	45
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	60
	Special [3]	------	------	------	------	25	35	30	40	------	------	2.0	3.0	------	------
Rt	Riverside loam, level.														
	Ordinary	9	(2)	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	12	15	25	35	45	65	55	85	35	50	2.8	4.5	------	250
Ru	Riverside loam, gently sloping.														
	Ordinary	9	(2)	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	12	15	25	35	45	65	55	85	35	50	2.8	4.5	------	250
Rv	Riverside loam, sloping.														
	Ordinary	------	------	------	------	15	(2)	20	(2)	12	(2)	1.0	(2)	------	60
	Intensive	------	------	------	------	25	35	30	40	17	25	1.4	2.5	------	80
	Special [3,6]	------	------	------	------	30	40	35	45	20	30	2.4	3.8	------	------
Rw	Riverside loam, strongly sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	45

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
	Intensive					20	30	25	35			1.0	2.0		60
	Special [3]					25	35	30	40			2.0	3.0		
Rg	Riverside cobbly loam, gently sloping.														
	Ordinary			17	([2])	25	([2])	35	([2])	20	([2])	1.9	([2])		150
	Intensive			21	27	35	50	45	60	25	35	2.6	3.7		235
	Special [3]			25	35	45	65	50	85	35	50	2.8	4.5		
Rh	Riverside cobbly loam, sloping.														
	Ordinary					15	([2])	20	([2])	12	([2])	1.0	([2])		60
	Intensive					25	35	30	40	17	27	1.4	2.5		80
	Special [3] [6]					30	40	35	45	20	30	2.4	3.8		
Rx	Riverside soils, moderately steep and steep [4]														
Ry	Riverwash [4]														
Sa	St. Joe loam and clay loam, level.														
	Ordinary													1.5	180
	Intensive													2.5	
Sb	St. Joe loam and clay loam, gently sloping.														
	Ordinary													1.5	180
	Intensive													2.5	
Sc	St. Joe loam and clay loam, sloping.														
	Ordinary													.8	100
	Intensive													1.3	
Sd	St. Joe loam and clay loam, drained, level.														
	Ordinary					25	([2])	35	([2])	20	([2])			1.7	160
	Intensive	11	14			40	55	50	75	30	45			2.7	250
Se	St. Joe loam and clay loam, drained, gently sloping.														
	Ordinary					25	([2])	35	([2])	20	([2])			1.7	160
	Intensive	11	14			40	55	50	75	30	45			2.7	250
Sf	Shook coarse sandy loam, sloping.														
	Dryland									11	([2])				
Sg	Shook coarse sandy loam, strongly sloping.														
	Dryland									11	([2])				
Sh	Shook coarse sandy loam, moderately steep [4]														
Sk	Skaggs silt loam, sloping.														
	Dryland									17	([2])				
Sl	Skaggs silt loam, strongly sloping.														
	Dryland									17	([2])				
Sm	Skaggs silt loam, moderately steep [4]														
Sn	Skaggs silt loam, steep [4]														
So	Skaggs-Sogn association, mountainous [4]														
Sp	Skalkaho gravelly loam, gently sloping.														
	Ordinary					15	([2])	20	([2])	12	([2])	1.0	([2])		60
	Intensive					25	35	30	40	17	27	1.4	2.5		80
	Special [3] [6]					30	40	35	45	20	30	2.4	3.8		
Ss	Skalkaho gravelly loam, sloping.														
	Ordinary					12	([2])	15	([2])			.8	([2])		45
	Intensive					20	30	25	35			1.0	2.0		60
	Special [3]					25	35	30	40			2.0	3.0		
Su	Skalkaho gravelly loam, strongly sloping.														
	Ordinary					12	([2])	15	([2])			.8	([2])		45
	Intensive					20	30	25	35			1.0	2.0		60
	Special [3]					25	35	30	40			2.0	3.0		
Sw	Skalkaho gravelly loam, moderately steep [4]														

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
Sr	Skalkaho gravelly coarse sandy loam, micaceous variant, gently sloping.														
	Ordinary	------	------	------	------	15	(2)	20	(2)	12	(2)	1.0	(2)	------	60
	Intensive	------	------	------	------	25	35	30	40	17	27	1.4	2.5	------	80
	Special [3,6]	------	------	------	------	30	40	35	45	20	30	2.4	3.8	------	------
St	Skalkaho gravelly coarse sandy loam, micaceous variant, sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	45
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	60
	Special [3]	------	------	------	------	25	35	30	40	------	------	2.0	3.0	------	------
Sv	Skalkaho gravelly coarse sandy loam, micaceous variant, strongly sloping.														
	Ordinary	------	------	------	------	12	(2)	15	(2)	------	------	.8	(2)	------	45
	Intensive	------	------	------	------	20	30	25	35	------	------	1.0	2.0	------	60
	Special [3]	------	------	------	------	25	35	30	40	------	------	2.0	3.0	------	------
Sx	Skalkaho gravelly coarse sandy loam, micaceous variant, moderately steep [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Sy	Skalkaho-Ravalli loams, gently sloping.														
	Dryland	------	------	------	------	------	------	------	------	11	(2)	------	------	------	------
Sz	Skalkaho-Ravalli loams, sloping.														
	Dryland	------	------	------	------	------	------	------	------	11	(2)	------	------	------	------
S2a	Skalkaho-Ravalli loams, strongly sloping.														
	Dryland	------	------	------	------	------	------	------	------	11	(2)	------	------	------	------
S2b	Skalkaho-Ravalli loams, moderately steep [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
S2c	Skalkaho-Ravalli stony loams, sloping and strongly sloping [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
S2d	Skalkaho-Ravalli stony loams, moderately steep and steep [4]	------	------	------	------	------	------	------	------	------	------	------	------	------	------
S2e	Slocum complex, shallow, slightly saline.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	.8	90
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	1.3	120
S2f	Slocum complex, shallow, moderately saline.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	.8	90
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	1.3	120
S2g	Slocum loam.														
	Ordinary	8	(2)	------	------	20	(2)	30	(2)	15	(2)	1.5	(2)	------	150
	Intensive	11	14	------	------	35	50	40	55	25	40	2.2	4.0	------	225
	Special [3]	12	15	------	------	40	55	45	60	30	50	2.4	4.0	------	------
S2h	Slocum loam, deep.														
	Ordinary	10	(2)	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	------	160
	Intensive	13	18	25	35	50	75	60	90	40	55	3.2	5.0	------	250
	Special [3]	15	20	------	------	------	------	------	------	------	------	------	------	------	------
S2k	Slocum loam, slightly saline.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	.8	90
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	1.3	120
S2l	Slocum loam, poorly drained variant.														
	Ordinary	------	------	------	------	------	------	------	------	------	------	------	------	1.0	160
	Intensive	------	------	------	------	------	------	------	------	------	------	------	------	1.7	------
S2m	Slocum sandy loam-gravelly sandy loam, shallow.														
	Ordinary	6	(2)	------	------	15	(2)	20	(2)	12	(2)	1.0	(2)	.8	60
	Intensive	8	10	------	------	25	35	30	40	17	27	1.4	2.5	1.4	80
	Special [3]	------	------	------	------	30	40	35	45	20	30	2.4	3.8	------	------

TABLE 10. — *Estimated acre yields of selected crops under different levels of management* — Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
S2n	Slocum - shallow muck complex.														
	Ordinary														90
S2o	Sogn-Skaggs loams and stony loams, strongly sloping.														
	Dryland									13	(2)				
S2p	Sogn-Skaggs loams and stony loams, moderately steep [4]														
S2r	Stecum coarse sandy loam, gently sloping.														
	Ordinary					12	(2)	15	(2)					.7	45
	Intensive					20	30	25	35					1.0	60
	Special [3]					25	35	30	40						
S2s	Stecum coarse sandy loam, sloping.														
	Ordinary					12	(2)	15	(2)					.7	45
	Intensive					20	30	25	35					1.0	60
	Special [3]					25	35	30	40						
S2t	Stecum coarse sandy loam, strongly sloping [4]														
S2u	Stecum stony loamy coarse sand, sloping [4]														
S2v	Stecum stony loamy coarse sand, strongly sloping [4]														
S2w	Stecum stony loamy coarse sand, moderately steep and steep [4]														
S3a	Sula silt loam, level.														
	Ordinary			15	(2)	25	(2)	35	(2)	20	(2)			1.7	160
	Intensive	11	14	21	27	40	55	50	75	30	45			2.7	250
S3b	Sula silt loam, gently sloping.														
	Ordinary			15	(2)	25	(2)	35	(2)	20	(2)			1.7	160
	Intensive	11	14	21	27	40	55	50	75	30	45			2.7	250
S3c	Sula silt loam, sloping.														
	Ordinary			12	(2)	20	(2)	30	(2)	15	(2)			1.2	150
	Intensive			18	24	35	50	40	55	25	40			2.2	225
S3d	Sula silt loam, strongly sloping.														
	Ordinary					15	(2)	20	(2)	12	(2)			.8	60
	Intensive					25	35	30	40	17	27			1.4	80
S2x	Sula loam variant-Ravalli loam, gently sloping and sloping.														
	Ordinary											.7	(2)	.8	60
	Intensive											1.4	2.5	1.4	80
S2y	Sula loam variant-Ravalli loam, strongly sloping [4]														
S2z	Sula loam variant-Ravalli loam, moderately steep and steep [4]														
S3e	Sula-Haccke silt loams, sloping.														
	Ordinary			12	(2)	20	(2)	30	(2)	15	(2)			1.2	150
	Intensive			18	24	35	50	40	55	25	40			2.2	225
S3f	Sula-Haccke silt loams, strongly sloping.														
	Ordinary					15	(2)	20	(2)	12	(2)			.8	60
	Intensive					25	35	30	40	17	27			1.4	80
Ta	Teton-Cheadle association, mountainous [4]														
Tb	Trapper association, mountainous [4]														
Vd	Victor loam, level.														
	Ordinary			15	(2)	25	(2)	35	(2)	20	(2)			1.7	160
	Intensive	11	14	21	27	40	55	50	75	30	45			2.7	250

TABLE 10.—*Estimated acre yields of selected crops under different levels of management*—Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
Ve	Victor loam, gently sloping.														
	Ordinary	----	----	15	(2)	25	(2)	35	(2)	20	(2)	----	----	1.7	160
	Intensive	11	14	21	27	40	55	50	75	30	45	----	----	2.7	250
Vh	Victor loam, imperfectly drained (seeped), level.														
	Ordinary	----	----	----	----	25	(2)	35	(2)	20	(2)	----	----	1.7	160
	Intensive	11	14	----	----	40	55	50	75	30	45	----	----	2.7	250
Va	Victor cobbly coarse sandy loam, gently sloping and sloping.														
	Ordinary	----	----	----	----	20	(2)	25	(2)	15	(2)	----	----	1.0	80
	Intensive	----	----	----	----	30	40	35	45	20	30	----	----	1.8	110
Vb	Victor gravelly coarse sandy loam, level.														
	Ordinary	----	----	----	----	20	(2)	25	(2)	15	(2)	----	----	1.0	80
	Intensive	----	----	----	----	30	40	35	45	20	30	----	----	1.8	110
Vc	Victor gravelly coarse sandy loam, gently sloping.														
	Ordinary	----	----	----	----	20	(2)	25	(2)	15	(2)	----	----	1.0	80
	Intensive	----	----	----	----	30	40	35	45	20	30	----	----	1.8	110
Vk	Victor gravelly coarse sandy loam, sloping and strongly sloping.														
	Ordinary	----	----	----	----	20	(2)	25	(2)	15	(2)	----	----	1.0	80
	Intensive	----	----	----	----	30	40	35	45	20	30	----	----	1.8	110
Vf	Victor loam, calcareous variant, level.														
	Ordinary	----	----	15	(2)	25	(2)	35	(2)	20	(2)	----	----	1.7	160
	Intensive	11	14	21	27	40	55	50	75	30	45	----	----	2.7	250
Vg	Victor loam, calcareous variant, gently sloping.														
	Ordinary	----	----	15	(2)	25	(2)	35	(2)	20	(2)	----	----	1.7	160
	Intensive	11	14	21	27	40	55	50	75	30	45	----	----	2.7	250
Vl	Victor - St. Joe cobbly loams, gently sloping.														
	Ordinary	----	----	----	----	----	----	----	----	----	----	----	----	----	90
Wa	Wemple - Bitterroot - Ravalli complex, level.														
	Ordinary	----	----	20	(2)	40	(2)	50	(2)	30	(2)	2.2	(2)	----	180
	Intensive	----	----	25	35	50	75	60	90	40	55	3.2	5.0	----	275
	Dryland	----	----	----	----	----	----	----	----	10	(2)	----	----	----	----
Wb	Wemple - Bitterroot - Ravalli complex, gently sloping.														
	Ordinary	----	----	20	(2)	40	(2)	50	(2)	30	(2)	2.2	(2)	----	180
	Intensive	----	----	25	35	50	75	60	90	40	55	3.2	5.0	----	275
	Dryland	----	----	----	----	----	----	----	----	10	(2)	----	----	----	----
Wc	Wemple - Bitterroot - Ravalli complex, sloping.														
	Ordinary	----	----	20	(2)	30	(2)	40	(2)	23	(2)	2.0	(2)	----	160
	Intensive	----	----	25	35	45	65	55	85	35	50	2.8	4.5	----	250
Wd	Wemple - Bitterroot - Ravalli complex, strongly sloping.														
	Ordinary	----	----	----	----	20	(2)	30	(2)	15	(2)	1.2	(2)	----	90
	Intensive	----	----	----	----	32	45	37	50	22	35	1.9	3.0	----	120
	Special [3]	----	----	----	----	40	55	45	60	30	50	2.4	4.0	----	----
We	Willoughby loam, level.														
	Ordinary	----	----	----	----	20	(2)	35	(2)	15	(2)	1.5	(2)	1.7	200
	Intensive	----	----	----	----	35	50	50	75	25	35	2.5	3.3	2.7	300
	Dryland	----	----	----	----	----	----	----	----	13	(2)	----	----	----	----
Wf	Willoughby loam, gently sloping.														
	Ordinary	----	----	----	----	20	(2)	35	(2)	15	(2)	1.5	(2)	1.7	200
	Intensive	----	----	----	----	35	50	50	75	25	35	2.5	3.3	2.7	300
	Dryland	----	----	----	----	----	----	----	----	13	(2)	----	----	----	----
Wg	Willoughby loam, sloping.														
	Ordinary	----	----	----	----	20	(2)	30	(2)	15	(2)	1.2	(2)	----	90
	Intensive	----	----	----	----	32	45	37	50	22	35	1.9	3.0	----	120
	Special [3]	----	----	----	----	40	55	45	60	30	50	2.4	4.0	----	----

TABLE 10.—*Estimated acre yields of selected crops under different levels of management*—Continued

Map symbol	Mapping unit and level of management	Sugar beets		Seed peas		Barley		Oats		Spring wheat		Alfalfa		Mixed hay	Irrigated pasture
		Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	Average	Average
		Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]
Wh	Woodrock association, mountainous [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Wo	Woodside stony sandy loam, gently sloping [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Wp	Woodside stony sandy loam, sloping [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Wr	Woodside stony sandy loam, strongly sloping [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ws	Woodside stony sandy loam, moderately steep [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Wt	Woodside very stony sandy loam, gently sloping [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Wu	Woodside very stony sandy loam, sloping [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Wv	Woodside very stony sandy loam, strongly sloping [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ww	Woodside very stony sandy loam, moderately steep [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Wx	Woodside very stony sandy loam, steep [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Wk	Woodside sandy loam, gently sloping.														
	Ordinary	---	---	---	---	12	([2])	15	([2])	---	---	---	---	.7	45
	Intensive	---	---	---	---	20	30	25	35	---	---	---	---	1.0	60
	Special [3]	---	---	---	---	25	35	30	40	---	---	---	---	---	---
Wl	Woodside sandy loam, sloping.														
	Ordinary	---	---	---	---	12	([2])	15	([2])	---	---	---	---	.7	45
	Intensive	---	---	---	---	20	30	25	35	---	---	---	---	1.0	60
	Special [3]	---	---	---	---	25	35	30	40	---	---	---	---	---	---
Wm	Woodside sandy loam, strongly sloping [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Wn	Woodside sandy loam, moderately steep [4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---

[1] Number of days in one year that a cow can graze one acre without injury to the pasture.

[2] No estimates of maximum yields were given for ordinary management or for dryland management.

[3] Intensive management, but sprinkler irrigation instead of flood or furrow irrigation.

[4] Suitable only for range.

[5] Too variable to rate.

[6] Intensive management, plus removal of stones.

[7] Intensive management, plus improvement of drainage.

[8] Intensive management, plus leaching of salt and improvement of drainage.

[9] No agricultural uses.

Soil Descriptions

The soil descriptions in this section are based on information obtained by examination of the soils in the field and data obtained by laboratory analysis of samples of the soils.

A soil is made up of several layers or horizons, one above the others. These are called, collectively, the soil profile. The principal divisions of the profile are (1) the surface soil, or A horizon, (2) the subsoil, or B horizon, (3) the parent material, or C horizon, and (4) the underlying rock, or D horizon. Often the C and D horizons are referred to as the substrata. Any of these four master horizons may be subdivided into several layers. The number and type of layers vary tremendously in different soils. A horizon that is prominent in one soil may be barely distinguishable or lacking in another. The subsoils of the Ravalli series, for example, are distinctly different from their surface soils and substrata in many characteristics, but the subsoils of the Burnt Fork series are merely transitional layers between the surface soils and the substrata.

The characteristics most commonly used in describing the horizons of a soil profile are color, consistence, texture, structure, reaction, thickness of horizons, and boundary. Color is described both for the dry soil and the moist soil.

Consistence determines how well the soil sticks together and how easily it can be worked. It is described as loose, soft, or hard when dry; loose, friable, or firm when moist; and sticky, nonsticky, plastic, or nonplastic when wet.

Texture means the relative proportions of sand, silt, and clay in the soil. Some of the more important textural classes are sand, loamy sand, sandy loam, loam, silt loam, clay loam, and clay.

The individual particles of sand, silt, and clay tend to cling together and form aggregates. Structure means the shape, size, distinctness, and durability of these aggregates. Common structure types are crumb, granular, platy, blocky, prismatic, and columnar.

Reaction refers to the degree of acidity or alkalinity; some soils are neutral.

The thickness of one horizon in a soil profile is usually given by stating the depth from the surface of the ground to the top and to the bottom boundaries of the horizon. The boundaries between horizons may be abrupt, clear, gradual, or diffuse. Abrupt boundaries have less than 1 inch of soil in the transition between one horizon and the next. Clear boundaries are 1 to 2½ inches wide, and gradual boundaries may be 2½ to 5 inches wide. If the transition takes more than 5 inches, the boundary is diffuse. The upper surface of a boundary may be smooth, wavy, or irregular. Some horizon boundaries are broken and disconnected.

Other characteristics frequently considered in describing and classifying soils are the parent material from which the soils developed; topographic position; slope gradient; drainage; salt, alkali, or lime content; stoniness; and size and shape of the area covered by a particular soil. Terms used in describing these characteristics usually are clear without special definition. More detailed explanations of how soils are described and mapped are explained in the Soil Survey Manual (*11*).

In the following pages, the soils mapped in the Bitterroot Valley Area are described in detail. The approximate acreage and proportionate extent of each soil in the Area are given in table 11.

TABLE 11.—*Approximate acreage and proportionate extent of soils*

Map symbol	Soil name	Area	Extent
		Acres	*Percent*
	Adel loam:		
Aa	Level	286	0.1
Ad	Gently sloping	359	.1
Ac	Sloping	45	(1)
	Alluvial cobbly land:		
Ab	Level	652	.1
Ae	Gently sloping and sloping	5,340	1.0
Af	Alluvial loamy land	3,817	.7
Ag	Alluvial land and valley slopes	1,348	.3
	Amsterdam silt loam:		
Ah	Level	163	(1)
Ak	Gently sloping	222	(1)
Al	Sloping	235	(1)
Am	Moderately steep and steep	102	(1)
	Amsterdam-Haccke silt loams:		
An	Gently sloping	527	.1
Ao	Sloping	228	(1)
Ap	Strongly sloping	177	(1)
	Bass coarse sandy loam:		
Bg	Gently sloping	1,264	.2
Bh	Sloping	1,375	.3
Bk	Strongly sloping	829	.2
	Bass cobbly coarse sandy loam:		
Ba	Gently sloping	174	(1)
Bb	Sloping	165	(1)
Bc	Strongly sloping	431	.1
	Bass gravelly coarse sandy loam:		
Bd	Gently sloping	409	.1
Be	Sloping	497	.1
Bf	Strongly sloping	364	.1
	Bass-Ravalli loams:		
Bl	Gently sloping	76	(1)
Bm	Sloping and strongly sloping	114	(1)
	Bitterroot silt loam:		
Bn	Level	120	(1)
Bo	Gently sloping	488	.1
Bp	Sloping	277	.1
Br	Strongly sloping	102	(1)
	Bitterroot-Burnt Fork cobbly loams:		
Bs	Gently sloping	261	(1)
Bt	Sloping	423	.1
Bu	Strongly sloping	677	.1
Bv	Bitterroot, Wemple, and Ravalli soils, shallow, moderately steep and steep	7,513	1.4
	Blodgett coarse sandy loam:		
B2c	Gently sloping	1,578	.3
B2d	Sloping	564	.1

TABLE 11.—*Approximate acreage and proportionate extent of soils*—Continued

Map symbol	Soil name	Area	Extent
		Acres	*Percent*
B2e	Strongly sloping	248	(1)
	Blodgett cobbly coarse sandy loam:		
Bw	Gently sloping	264	(1)
Bx	Sloping	821	.2
By	Strongly sloping	902	.2
	Blodgett gravelly coarse sandy loam:		
Bz	Gently sloping	1,712	.3
B2a	Sloping	1,584	.3
B2b	Strongly sloping	648	.1
B2f	Blodgett, Bass and Victor very stony soils	1,181	.2
B2g	Blodgett and Bass soils, undifferentiated, moderately steep and steep	2,263	.4
	Breece loamy coarse sand:		
B2p	Gently sloping	663	.1
B2r	Sloping	518	.1
B2s	Strongly sloping	121	(1)
	Breece gravelly loamy coarse sand:		
B2h	Gently sloping	146	(1)
B2k	Sloping	257	(1)
B2l	Strongly sloping	409	.1
	Breece sandy loam:		
B2m	Level	279	.1
B2n	Gently sloping	406	.1
B2o	Sloping	89	(1)
	Brownlee-Duffy-Ravalli loams:		
B2t	Sloping	414	.1
B2u	Strongly sloping	3,146	.6
B2v	Moderately steep	1,771	.3
B2w	Steep	24	(1)
B2x	Brownlee-Stecum association, mountainous	36,981	7.0
	Burnt Fork loam:		
B3f	Level	2,806	.5
B3g	Gently sloping	4,672	1.0
B3h	Sloping	1,453	.3
B3k	Strongly sloping	82	(1)
	Burnt Fork cobbly loam:		
B2y	Gently sloping	427	.1
B2z	Sloping	1,501	.3
B3a	Strongly sloping	588	.1
	Burnt Fork gravelly loam:		
B3b	Level	26	(1)
B3c	Gently sloping	586	.1
B3d	Sloping	270	.1
B3e	Strongly sloping	363	.1
	Burnt Fork very stony loam:		
B3l	Gently sloping and sloping	411	.1
B3m	Strongly sloping	1,203	.2
B3n	Burnt Fork and Bitterroot soils, undifferentiated, moderately steep and steep	1,754	.3
	Burnt Fork-Ravalli loams:		
B3s	Level	370	.1
B3t	Gently sloping	2,570	.5
B3u	Sloping	2,844	.5
B3v	Strongly sloping	527	.1
	Burnt Fork-Ravalli cobbly loams:		
B3o	Gently sloping	114	(1)
B3p	Sloping	881	.2
B3r	Strongly sloping	788	.1
	Burnt Fork-Ravalli loams, arkosic variants:		
B3w	Gently sloping	100	(1)
B3x	Sloping	240	(1)
B3y	Strongly sloping	80	(1)
	Burnt Fork and Riverside loams, imperfectly drained (seeped):		
B3z	Level and gently sloping	517	.1
B4a	Sloping and strongly sloping	409	.1
B4b	Moderately steep	123	(1)
	Castner stony loam:		
Cm	Sloping and strongly sloping	1,516	.3
Cn	Moderately steep and steep	5,250	1.0
Cb	Chamokane fine sandy loam	2,531	.5
Cc	Chamokane gravelly loamy sand, shallow	4,610	1.0
Cd	Chamokane loamy fine sand	225	(1)
Ce	Chamokane loamy sand-sandy loam, shallow	4,880	1.0
Ca	Chamokane complex	15,530	3.0
	Charlos loam:		
Cf	Gently sloping	498	.1
Cg	Sloping	703	.1
Ch	Strongly sloping	343	.1
	Charlos silt loam:		
Ck	Level	68	(1)
Cl	Gently sloping	287	.1
	Chereete stony coarse sandy loam:		
Cw	Level	273	.1
Cx	Gently sloping	3,380	.6
Cy	Sloping	452	.1
	Chereete very stony coarse sandy loam:		
Cz	Level	175	(1)
C2a	Gently sloping	927	.2
C2b	Sloping	366	.1
	Chereete gravelly coarse sandy loam:		
Co	Level	1,102	.2
Cp	Gently sloping	1,075	.2
Cr	Sloping	100	(1)
	Chereete sandy loam:		
Cs and Cu	Level	1,856	.4
Ct and Cv	Gently sloping	383	.1
	Clark Fork fine sandy loam:		
C2f	Level	426	.1
C2g	Gently sloping	506	.1
C2h	Clark Fork gravelly fine sandy loam, level	1,040	.2
	Clark Fork cobbly sandy loam:		
C2c	Level	610	.1
C2d	Gently sloping	1,395	.3
C2e	Sloping	319	.1
	Clark Fork very stony sandy loam:		
C2m	Gently sloping and sloping	1,310	.2
C2n	Strongly sloping	271	.1
	Clark Fork loam:		
C2k	Level	226	(1)
C2l	Gently sloping	369	.1
	Como gravelly coarse sandy loam:		
C2n	Gently sloping	618	.1
C2p	Sloping	1,136	.2
C2r	Strongly sloping	1,111	.2
C2s	Moderately steep	695	.1
C2t	Steep	833	.2
	Como coarse sandy loam:		
C2u	Gently sloping	435	.1
C2v	Sloping	701	.1
C2w	Strongly sloping	233	(1)

TABLE 11.—*Approximate acreage and proportionate extent of soils*—Continued

Map symbol	Soil name	Area	Extent
		Acres	*Percent*
C2x	Moderately steep	59	(1)
	Como stony coarse sandy loam:		
C2y	Gently sloping	278	.1
C2z	Sloping	1,307	.2
C3a	Strongly sloping	1,610	.3
C3b	Moderately steep	1,802	.3
	Como stony and very stony coarse sandy loams:		
C3c	Gently sloping	6	(1)
C3d	Sloping	691	.1
C3e	Strongly sloping	887	.2
C3f	Moderately steep	1,122	.2
C3g	Steep	4,748	1.0
	Cooney loam:		
C3h	Sloping	119	(1)
C3k	Strongly sloping	608	.1
C3l	Moderately steep	366	.1
	Cooney-Haccke silt loams:		
C3m	Sloping	494	.1
C3n	Strongly sloping	423	.1
C3o	Moderately steep	171	(1)
C3p	Corvallis silt loam	973	.2
C3r	Corvallis silt loam, poorly drained variant	650	.1
C3s	Corvallis silt loam, slightly saline	2,075	.4
C3t	Corvallis silt loam, moderately saline	794	.1
C3u	Corvallis silt loam, cobbly subsoil	1,380	.3
C3v	Corvallis silt loam, moderately shallow, slightly saline	842	.2
	Dominic very cobbly sandy loam:		
De	Level	270	.1
Df	Gently sloping	1,552	.3
	Dominic cobbly loam:		
Da	Level	881	.2
Db	Gently sloping	1,240	.2
	Dominic gravelly loamy sand:		
Dc	Level	740	.1
Dd	Gently sloping	74	(1)
Gf	Gallatin silty clay loam, level	258	(1)
	Gallatin loam:		
Ga	Drained, level	586	.1
Gb	Drained, gently sloping	32	(1)
Gc	Gallatin loam-gravelly loam, level	1,643	.3
	Gallatin silt loam:		
Gd	Level	907	.2
Ge	Gently sloping	52	(1)
	Gallatin-shallow muck complex:		
Gh	Level	1,594	.3
Gk	Gently sloping	1,216	.2
	Gird silt loam:		
Go	Sloping	80	(1)
Gp	Strongly sloping	171	(1)
Gr	Moderately steep	224	(1)
Gs	Steep	54	(1)
	Gird silt loam, high lime subsoil variant:		
Gt	Gently sloping	62	(1)
Gu	Sloping	406	.1
Gv	Strongly sloping	856	.2
Gw	Moderately steep	194	(1)
Gx	Steep	56	(1)
	Gird fine sandy loam, sandy subsoil variant:		
Gl	Gently sloping	27	(1)
Gm	Strongly sloping	82	(1)
Gn	Moderately steep and steep	106	(1)
	Gird-Haccke silt loams:		
Gy	Sloping	884	.2
Gz	Strongly sloping	1,417	.3
G2a	Moderately steep	373	.1
G2b	Steep	49	(1)
	Gird-Teton-Haccke loams:		
G2c	Strongly sloping	877	.2
G2d	Moderately steep	703	.1
G2e	Steep	233	(1)
	Gorus silt loam:		
G2f	Gently sloping	160	(1)
G2g	Sloping	243	(1)
G2h	Strongly sloping	187	(1)
G2k	Moderately steep	44	(1)
	Grantsdale loam:		
G2n	Level	3,565	.7
G2o	Gently sloping	180	(1)
	Grantsdale cobbly loam, imperfectly drained variant:		
G2l	Level	1,388	.3
G2m	Slightly saline, level	129	(1)
	Grantsdale loam, shallow, and Dominic sandy loam:		
G2p	Level	2,381	.4
G2r	Gently sloping	337	.1
G2u	Grantsdale and Dominic soils, very shallow, strongly sloping	65	(1)
	Grantsdale-Dominic cobbly loams:		
G2s	Level	294	.1
G2t	Gently sloping	91	(1)
G2v	Gravel pits and dumps	103	(1)
	Greeley sandy loam:		
G2w	Level	516	.1
G2x	Gently sloping	226	(1)
G2y	Sloping	40	(1)
	Hamilton silt loam:		
Hc	Level	2,746	.5
Hd	Gently sloping	237	(1)
	Hamilton fine sandy loam:		
Ha	Level	1,011	.2
Hb	Gently sloping	374	.1
He	Hamilton-Corvallis sandy loams, level	507	.1
Hf	Hamilton-Corvallis silt loams, level	1,665	.3
Hg	Holloway association, mountainous	44,039	8.4
Ka	Kenspur fine sandy loam	523	.1
	Laporte stony loam:		
La	Sloping and strongly sloping	309	.1
Lb	Moderately steep and steep	4,534	1.0
	Larry clay loam:		
Lc	Level	443	.1
Ld	Drained, level	170	(1)
Le	Drained, gently sloping	89	(1)
Lf	Gently sloping	556	.1
Lg	Sloping	88	(1)
	Larry silt loam:		
Lh	Level	245	(1)
Lk	Drained, level	211	(1)
Ll	Gently sloping	350	.1
Lm	Drained, gently sloping	138	(1)
Ln	Sloping	137	(1)
	Lick loam:		
Lu	Gently sloping	282	.1
Lw	Sloping	784	.1
Lx	Strongly sloping	1,075	.2
Ly	Moderately steep	2,367	.4
	Lick gravelly loam:		
Lo	Gently sloping	43	(1)

TABLE 11.—*Approximate acreage and proportionate extent of soils*—Continued

Map symbol	Soil name	Area	Extent
		Acres	*Percent*
Lp	Sloping	101	([1])
Lr	Strongly sloping	140	([1])
Ls	Moderately steep	223	([1])
	Lick stony loam:		
L2b	Sloping	70	([1])
L2c	Strongly sloping	153	([1])
L2d	Moderately steep	1,548	.3
L2e	Steep	178	([1])
	Lick loam, imperfectly drained variant:		
Lt	Level	97	([1])
Lv	Gently sloping	306	.1
Lz	Sloping	71	([1])
L2a	Strongly sloping	48	([1])
	Lolo gravelly loam:		
L2g	Level	207	([1])
L2h	Gently sloping	1,480	.3
L2f	Lolo cobbly loam, gently sloping	1,052	.2
	Lone Rock coarse sandy loam:		
L2m	Level	1,680	.3
L2n	Gently sloping	546	.1
L2o	Sloping	129	([1])
L2k	Lone Rock cobbly coarse sandy loam, level	274	.1
L2l	Lone Rock fine sandy loam, dark colored variant, level	249	([1])
	Maiden-Gird silt loams:		
Ma	Gently sloping	20	([1])
Mb	Sloping	83	([1])
Mc	Strongly sloping	283	.1
Md	Moderately steep	8	([1])
Pa	Peat	484	.1
Pb	Peat, shallow over silt	445	.1
Pc	Peat, shallow over gravel	354	.1
	Poverty cobbly loam:		
Pd	Level	913	.2
Pe	Gently sloping	318	.1
Pf	Sloping	96	([1])
Pg	Poverty loam, gently sloping	259	([1])
	Poverty coarse sandy loam:		
Ph	Level	323	.1
Pk	Gently sloping	401	.1
Pl	Sloping	146	([1])
	Poverty very stony coarse sandy loam:		
Pm	Gently sloping	487	.1
Pn	Sloping	211	([1])
	Ravalli-Bitterroot cobbly loams, shallow:		
Ra	Gently sloping	77	([1])
Rb	Sloping	627	.1
Rc	Strongly sloping	952	.2
	Ravalli-Bitterroot loams, shallow:		
Rd	Gently sloping	178	([1])
Re	Sloping	161	([1])
Rf	Strongly sloping	61	([1])
	Riverside cobbly sandy loam:		
Rk	Gently sloping	121	([1])
Rl	Sloping	432	.1
	Riverside gravelly sandy loam:		
Rr	Gently sloping	115	([1])
Rs	Sloping	390	.1
Rp	Riverside gravelly and cobbly sandy loams, strongly sloping	1,850	.4
	Riverside fine sandy loam:		
Rm	Gently sloping	455	.1
Rn	Sloping	601	.1
Ro	Strongly sloping	112	([1])
	Riverside loam:		
Rt	Level	436	.1
Ru	Gently sloping	1,161	.2
Rv	Sloping	353	.1
Rw	Strongly sloping	111	([1])
	Riverside cobbly loam:		
Rg	Gently sloping	212	([1])
Rh	Sloping	275	.1
Rx	Riverside soils, moderately steep and steep	4,854	1.0
Ry	Riverwash	2,836	.5
	St. Joe loam and clay loam:		
Sa	Level	1,013	.2
Sb	Gently sloping	1,100	.2
Sc	Sloping	465	.1
Sd	Drained, level	282	.1
Se	Drained, gently sloping	29	([1])
	Shook coarse sandy loam:		
Sf	Sloping	100	([1])
Sg	Strongly sloping	1,134	.2
Sh	Moderately steep	240	
	Skaggs silt loam:		([1])
Sk	Sloping	322	.1
Sl	Strongly sloping	1,247	.2
Sm	Moderately steep	1,284	.2
Sn	Steep	206	([1])
So	Skaggs-Sogn association, mountainous	3,146	.6
	Skalkaho gravelly loam:		
Sp	Gently sloping	206	([1])
Ss	Sloping	47	([1])
Su	Strongly sloping	287	.1
Sw	Moderately steep	30	([1])
	Skalkaho gravelly coarse sandy loam, micaceous variant:		
Sr	Gently sloping	165	([1])
St	Sloping	975	.2
Sv	Strongly sloping	563	.1
Sx	Moderately steep	97	([1])
	Skalkaho-Ravalli loams:		
Sy	Gently sloping	617	.1
Sz	Sloping	2,111	.4
S2a	Strongly sloping	1,225	.2
S2b	Moderately steep	225	([1])
	Skalkaho-Ravalli stony loams:		
S2c	Sloping and strongly sloping	1,591	.3
S2d	Moderately steep and steep	1,122	.2
S2g	Slocum loam	4,356	.8
S2h	Slocum loam, deep	355	.1
S2k	Slocum loam, slightly saline	1,308	.2
S2l	Slocum loam, poorly drained variant	1,535	.3
S2m	Slocum sandy loam-gravelly sandy loam, shallow	1,828	.3
	Slocum complex, shallow:		
S2e	Slightly saline	382	.1
S2f	Moderately saline	120	([1])
S2n	Slocum-shallow muck complex	3,211	.6
	Sogn-Skaggs loams and stony loams:		
S2o	Strongly sloping	398	.1
S2p	Moderately steep	353	.1
	Stecum coarse sandy loam:		
S2r	Gently sloping	90	([1])
S2s	Sloping	363	.1
S2t	Strongly sloping	1,016	.2
	Stecum stony loamy coarse sand:		
S2u	Sloping	191	([1])
S2v	Strongly sloping	1,496	.3

TABLE 11.—*Approximate acreage and proportionate extent of soils*—Continued

Map symbol	Soil name	Area	Extent
		Acres	*Percent*
S2w	Moderately steep and steep	11,051	2.1
	Sula silt loam:		
S3a	Level	19	[1]
S3b	Gently sloping	424	.1
S3c	Sloping	200	[1]
S3d	Strongly sloping	26	[1]
	Sula loam variant-Ravalli loam:		
S2x	Gently sloping and sloping	743	.1
S2y	Strongly sloping	220	[1]
S2z	Moderately steep and steep	518	.1
	Sula-Haccke silt loams:		
S3e	Sloping	144	[1]
S3f	Strongly sloping	153	[1]
Ta	Teton-Cheadle association, mountainous	18,530	3.5
Tb	Trapper association, mountainous	3,489	.7
	Victor loam:		
Vd	Level	1,742	.3
Ve	Gently sloping	2,015	.4
Vh	Imperfectly drained (seeped), level	247	[1]
Va	Victor cobbly coarse sandy loam, gently sloping and sloping	770	.1
	Victor gravelly coarse sandy loam:		
Vb	Level	1,076	.2
Vc	Gently sloping	1,143	.2
Vk	Sloping and strongly sloping	159	[1]
	Victor loam, calcareous variant:		
Vf	Level	393	.1
Vg	Gently sloping	106	[1]
Vl	Victor-St. Joe cobbly loams, gently sloping	1,011	.2
	Wemple-Bitterroot-Ravalli complex:		
Wa	Level	22	[1]
Wb	Gently sloping	914	.2
Wc	Sloping	1,020	.2
Wd	Strongly sloping	438	.1
	Willoughby loam:		
We	Level	2,215	.4
Wf	Gently sloping	3,541	.7
Wq	Sloping	209	[1]
Wh	Woodrock association, mountainous	110,611	20.7
	Woodside stony sandy loam:		
Wo	Gently sloping	41	[1]
Wp	Sloping	1,025	.2
Wr	Strongly sloping	1,749	.3
Ws	Moderately steep	1,284	.2
	Woodside very stony sandy loam:		
Wt	Gently sloping	33	[1]
Wu	Sloping	184	[1]
Wv	Strongly sloping	1,327	.3
Ww	Moderately steep	1,398	.3
Wx	Steep	9,755	1.8
	Woodside sandy loam:		
Wk	Gently sloping	114	[1]
Wl	Sloping	231	[1]
Wm	Strongly sloping	258	[1]
Wn	Moderately steep	34	[1]
	Mine dump	41	[1]
	Water	3,859	.7
	Total	533,760	100.0

[1] Less than 1/20 of 1 percent. All other figures rounded to nearest tenth of 1 percent.

Adel Series

The Adel soils are productive, dark, loamy soils that developed in medium- to fine-textured local wash. They occur on colluvial slopes at the bases of terrace and upland breaks and on fans at the mouths of local draws. Slopes range from 0 to 15 percent. Areas are small and scattered, the larger and more nearly typical being in the upper valley near Darby. The soils have developed under grass; the normal annual precipitation ranges from 14 to 17 inches, and the growing season is moderately long.

The Adel soils have thick, very dark grayish-brown to black, friable surface soils; moderately thick, very dark grayish-brown, friable loam subsoils; and yellowish brown, generally noncalcareous, loamy substrata that become gravelly below 30 inches. Moisture, air, and roots penetrate all horizons easily. Although additional moisture is received from higher slopes, drainage is generally good enough that the soils are suitable for all crops commonly grown in the valley. Moisture-holding capacity is good to depths of 3 to 5 feet. Natural fertility is high.

The Adel soils have finer textured, more coherent subsoils and substrata than the associated Breece soils. They are darker colored than the Grantsdale soils and are neutral to slightly acid rather than calcareous. They are much better drained than the Larry soils.

Profile of Adel loam:

A_1 0 to 10 inches, very dark grayish-brown (dry) to black (moist) friable loam; moderate medium granular structure; slightly acid; relatively high in organic matter.

A_3 10 to 18 inches, dark grayish-brown (dry) to very dark grayish-brown (moist) friable loam transition horizon; moderate medium granular structure; slightly acid.

B 18 to 32 inches, pale-brown (dry) to dark grayish-brown (moist) permeable heavy loam; weak subangular blocky structure; neutral reaction.

C 32 to 48 inches, light yellowish-brown (dry) to yellowish-brown (moist) weakly stratified friable loam and sandy loam; noncalcareous.

The thickness of the surface soil varies from 8 to 18 inches. In the drier sites the B horizon may be yellowish rather than grayish brown. In some locations the substratum is gravelly below 30 inches.

Adel loam, level (Aa).—This soil occurs on the lower parts of local colluvial slopes and fans, where they merge with the alluvial fans and terraces of the valley. Slopes are less than 2 percent. Although the

areas are small, their size and position permit management as separate fields. They are generally smooth and easy to irrigate.

Most of this soil is cultivated. It is commonly used for small grains grown in rotation with alfalfa, red clover, or mixed legume-grass hay. Peas or a truck crop may be substituted for small grains in the rotation. On some farms, sugar beets are grown. Small patches in the narrow side valleys are used for gardens and home orchards. Yields are relatively high.

Adel loam, gently sloping (Ab).—This soil occurs in association with Adel loam, level, but slightly higher on the slope and on more convex local fans. Slopes range from 2 to 5 percent. The profile and variations are as described for the series.

Use and management practices are similar to those for Adel loam, level. Fewer row crops are grown because of the risk of erosion if this soil is irrigated when not well protected by vegetation. Yields are comparable to those on the level phase.

Adel loam, sloping (Ac).—This soil occurs chiefly on the upper parts of colluvial slopes, where they merge with the terrace and upland breaks. The areas are generally concave, and slopes are extremely variable. Most of this phase is on slopes of 5 to 9 percent. In some areas, slopes are as steep as 15 percent. The profile is like that described for the series, but it varies more within each area than do those of the level and gently sloping phases. The colluvial material is less than 3 feet deep in places.

Adel loam, sloping, is used chiefly for pasture and hay. It is never used for row crops. Where irrigation water can be properly controlled, yields are moderately high. Areas above the ditches remain in native range.

Alluvial Lands

The Alluvial lands are a group of undifferentiated mapping units on narrow flood plains along stream channels. These soils occur in small patches that are separated by meandering channels and low terrace breaks. Although many of the soils are suitable for cultivation, the areas are too small for any use that requires anything larger than garden-sized patches. The most common use is pasture.

Alluvial cobbly land, level (Ad).—Most of this mapping unit is near Stevensville. It is seeped land underlain by coarse gravel and cobbles similar to those over which the Dominic soils developed. It supports a dense cover of sedges and moisture-loving grasses. It is too stony and wet to be cultivated. This land is used for pasture, and its carrying capacity is relatively high.

Alluvial cobbly land, gently sloping and sloping (Ae).—This mapping unit occurs chiefly along creeks on the west side of the valley. Slopes range mostly from 2 to 5 percent but are as steep as 9 percent in a few areas. Drainage varies from good to poor. There is considerable danger of flooding during spring runoff.

This soil is droughty and of low inherent fertility. It is too cobbly and stony to be cultivated. Most of the areas are timbered. Ponderosa pine, Douglas-fir, cottonwood, and willow are the chief species. In most places there is a sparse to moderately thick understory of grasses and shrubs, which provides some forage for livestock.

Alluvial loamy land (Af).—This mapping unit occurs along drainage channels and creeks, chiefly on the east side. It is in narrow strips, many of which are broken into small garden-sized patches by meandering channels. The soils are generally loamy and free of stones or gravel to depths of 2 feet or more. Drainage ranges from good to imperfect. Some areas are subirrigated; others are irrigated by waste water.

If these areas were larger, many of them would be well suited to cultivation. Nearly all are now used for pasture. The principal vegetation is grasses, sedges, and scattered shrubs. Carrying capacity varies widely according to the moisture supply.

Alluvial land and valley slopes (Ag).—This mapping unit occupies narrow valleys in mountainous areas, and it includes the flood plains and local alluvial slopes. Slopes are as steep as 25 percent in some places. The soils are broken into small patches by channels and slope breaks. It is almost impossible to find fields large enough for regular farming. Drainage ranges from good to poor. Most of the areas are timbered.

Amsterdam Series

The Amsterdam are moderately dark colored, friable soils developed in silty, stone-free, windblown deposits that mantle parts of the Tertiary benches on the east side of the valley. Slopes range up to 15 percent and more. The soils have developed under grass. The normal annual precipitation is 13 to 16 inches, and the growing season is moderately long.

These are deep, permeable soils of high productivity. They are generally free of pebbles and cobblestones. Moisture-holding capacity is high. Both surface drainage and underdrainage are good. The natural fertility is as high as that of any soil in the survey Area. Because of the uniformly silty texture, the sloping phases are very likely to erode.

Associated with the Amsterdam are soils of the Bitterroot and Burnt Fork series. The Amsterdam series has unconsolidated, permeable substrata, but the Bitterroot has substrata of Tertiary siltstone and sandstone. The Burnt Fork series contains stones and is more calcareous than the Amsterdam.

Profile of Amsterdam silt loam:

A_1 0 to 8 inches, grayish-brown (dry) to dark-gray (moist) friable silt loam; well-developed fine crumb structure; neutral reaction.

A_3 8 to 12 inches, pale-brown (dry) to dark grayish-brown (moist) friable silt loam; weak thick platy structure; crushes to medium crumb structure.

B_2 12 to 20 inches, light yellowish-brown (dry) to brown (moist) friable silt loam; weak coarse subangular blocky structure; slightly alkaline.

C_{ca} 20 to 32 inches, very pale brown (dry) to light yellowish-brown (moist) silt loam; highly calcareous.

C 32 to 48 inches, calcareous silt loam or very fine sandy loam, usually somewhat more yellow than the layer above. This horizon grades into Tertiary strata that vary in texture and in degree of consolidation.

Total thickness of the silty horizons varies from about 36 to 60 inches or more. The underlying ma-

terial may be any of the Tertiary beds. On the low benches northeast of Corvallis, the underlying material is gravel, but on the high benches loamy materials predominate.

Amsterdam silt loam, level (Ah).—This soil occurs mostly on the lower terracelike benches next to the central valley. Slopes are less than 2 percent. The profile is like that described for the series.

Usually the supply of irrigation water is ample during the entire growing season. Most areas are suitable for a wide range of crops and are intensively cultivated. Legume hays, usually alfalfa, are commonly rotated with small grains and specialty crops such as peas and sugar beets. On smaller farms this soil may be used for small fruits and truck crops. Under good management, average yields are high. Perennial pastures are uncommon. Although this soil is nearly level, it may erode unless irrigation water is handled carefully.

Amsterdam silt loam, gently sloping (Ak).—This soil occurs on higher benches. Slopes are from 2 to 5 percent. The soil will erode if flood or furrow irrigated when not covered by vegetation.

Use and management are about the same as for Amsterdam silt loam, level. Fewer row crops are grown, and farmers regulate early spring irrigation more carefully because of the risk of erosion. Yields are about the same as on the level phase.

Amsterdam silt loam, sloping (Al).—This soil occurs on the higher Tertiary benches, in association with Amsterdam silt loam, gently sloping. Slopes range from 5 to 9 percent; in a few areas they range up to 15 percent. This soil is very susceptible to erosion.

Most of this soil is used as rotation cropland, but it is used for hay crops and pastures to a greater extent than the level and gently sloping phases. The crops most commonly grown are small grains, peas, alfalfa, alfalfa and bromegrass, and seeded perennial pasture mixtures of grasses and legumes. Yields are only a little lower than on the level and gently sloping phases.

Amsterdam silt loam, moderately steep and steep (Am).—This soil occurs next to drainageways on the higher Tertiary benches. Most of it is on north-facing slopes. Its profile is as deep as those of the more gently sloping phases, except where it has been eroded.

Because of the very great danger of erosion and the difficulty of cultivation, nearly all areas of this soil are in seeded or native perennial pastures.

Amsterdam-Haccke Complex

This mapping unit consists of Amsterdam and Haccke soils so intermixed that they cannot be mapped or farmed separately. The friable Amsterdam soils predominate in the complex. The Haccke soils, which have a columnar claypan in the upper subsoil, occur in scattered streaks and spots within areas of the Amsterdam soils. Both soils of the complex have developed in the deep mantle of wind-deposited silt that covers parts of the benches on the east side of the valley.

This complex differs from the Burnt Fork-Ravalli complex in being free of stones and pebbles. The Ravalli-Bitterroot complex, shallow, overlies a substratum of Tertiary siltstone or sandstone, but the substratum of the Amsterdam-Haccke complex is unconsolidated and permeable. The Gird-Haccke complex occurs at higher elevations and has a darker colored surface soil and a bedrock substratum.

The typical Amsterdam profile is described under the Amsterdam series. A profile of the Haccke series follows:

A_1 0 to 5 inches, light brownish-gray (dry) to grayish-brown (moist) friable silt loam; well-developed thin platy structure, which breaks to crumb if soil is cultivated; in virgin areas the lower half inch may be light gray and ashy; neutral reaction.

B_2 5 to 10 inches, yellowish-brown (dry) to dark-brown (moist) silty clay loam; distinctly lighter colored when crushed; strong medium to coarse columnar structure; plastic when wet, hard when dry; moderately alkaline; abrupt boundary between A_1 and B_2 horizons.

B_{3ca} 10 to 16 inches, light yellowish-brown (dry) to yellowish-brown (moist) firm silty clay loam; moderate irregularly prismatic structure; spotted and splotched with lime; may contain visible crystals of gypsum; moderately alkaline.

C 16 to 36 inches, brownish-yellow (dry) to yellowish-brown (moist) friable silt loam; calcareous; this material may continue to depths of 5 feet or more or may give way to permeable unconsolidated material of different texture.

This soil is well drained. All horizons except the B_2 are permeable. The upper subsoil swells when wet. In the laboratory, little or no water will percolate through it. In the field, it absorbs water slowly. The entire profile is usually moist in spring, but it is difficult to replenish the moisture supply during the growing season. Loss of surface soil by erosion may seriously reduce productive capacity.

The relative proportions of the two soils in the complex differ somewhat from area to area. However, the strongly developed claypan profile rarely occupies more than 15 or 20 percent of an area. The remainder consists of the friable Amsterdam silt loam and intergrading profiles.

Amsterdam-Haccke silt loams, gently sloping (An).—This mapping unit occurs on the higher benches where the gradient is from 2 to 5 percent. These soils will erode if flood or furrow irrigated when they are bare of vegetation.

Use and management, under irrigation, are similar to those for Amsterdam silt loam, gently sloping. However, yields vary more from year to year, and average yields are a little lower. The spots of Haccke soil are hard to till because of the claypan, and the surface may crust so that seedlings cannot break through. These spots are more affected by hot, dry weather than the surrounding friable soils, and ripening of small grains may be uneven. Some farmers improve these spots by heavy and repeated applications of manure and phosphate.

Rotations of small grains and legume hays and occasionally peas or some other special crop are commonly used. Some areas are used for pasture. A few areas above the Bitterroot Valley Irrigation District canal are dryland farmed under an alternate crop-fallow system.

Amsterdam-Haccke silt loams, sloping (Ao).—This mapping unit occurs on the higher benches and on their sloping edges. Slopes range from 5 to 9 percent. The soils are very likely to erode if irrigated when bare of vegetation.

Most areas of this complex are included in the rotation cropland. Hay and pasture crops generally predominate. Yields are a little lower than on the associated gently sloping phase.

Amsterdam-Haccke silt loams, strongly sloping (Ap).—This mapping unit occurs next to drainageways on the higher benches. It is associated with the more gently sloping phases of the Amsterdam-Haccke complex. The slopes of 9 to 15 percent are smooth but a little too steep to be easily tilled.

The areas under irrigation are used mostly for pastures, but some are used for hay and small grains. The areas above the canals are now mostly in pasture. The fields formerly dry-farmed have been seeded to crested wheatgrass.

Bass Series

The Bass soils occur on the west side of the valley, on the high fans and their sloping edges. They developed in strongly weathered, compacted, granitic, bouldery outwash. Drainage is good. Originally, the vegetation was either grass or open stands of timber that had an understory of grass. The influence of grass was dominant in soil formation. The normal annual precipitation is 12 to 15 inches. The growing season is moderately long. Typical areas of this soil occur south of Bass Creek.

Bass soils have moderately thick, very dark colored, gritty surface soils and moderately thick, brown, friable, coarse sandy loam subsoils. The brown color of the subsoils appears "reddish brown" in comparison to the colors of other soils in the valley. The substratum is a compact mass of strongly weathered granitic boulders and cobblestones. The soils are moderately deep. Moisture-holding capacity and inherent fertility are moderately high. Underdrainage is good. Runoff is moderate to rapid, depending on slope. The soils are not particularly erosive. Cobblestones in varying quantities are scattered on the surface. In most fields, it has been necessary to remove stones to make cultivation possible.

Bass soils are intermediate in characteristics between the Charlos and the Blodgett soils. The Charlos soils developed in heavier, more completely weathered material. The Blodgett soils developed in looser, more gravelly material. The Bass soils are much darker colored than the Lick soils, which developed in similar material but under dense coniferous forest.

Profile of Bass coarse sandy loam:

A_1 0 to 7 inches, grayish-brown (dry) to very dark gray (moist) friable coarse sandy loam; moderate crumb structure; slightly acid.

B_2 7 to 13 inches, brown gritty loam or coarse sandy loam; weak subangular blocky structure; somewhat sticky but friable; slightly acid.

B_3 13 to 24 inches, light yellowish-brown (dry) to brown (moist) coarse sandy loam; contains strongly weathered cobblestones and boulders; slightly acid.

C 24 to 48 inches, strongly weathered mass of granitic boulders and cobblestones; some gritty fine earth between stones; material becomes looser and less weathered with depth.

As mapped, the Bass series has a rather wide range in characteristics. Some profiles are nearly as strongly weathered and as heavy as those of Charlos loam. At the other extreme are profiles nearly as loose as those of the Blodgett soils. Color of the subsoil varies from grayish brown to strong brown, and textures vary from heavy loam to coarse sandy loam.

Bass coarse sandy loam, gently sloping (Bg).—This soil occurs on the smoother parts of the high fans. Most of it is on slopes of from 2 to 5 percent, but a few small areas are on slopes of less than 2 percent. This is one of the better soils on the west side of the valley. It is generally smooth and easy to irrigate. Stones do not interfere much with plowing. Under good management, the productive capacity is moderately high.

On farms that have enough irrigation water, hay is the usual crop. Timothy, orchardgrass, smooth bromegrass, red clover, and alsike clover are the common hay plants. These may be seeded separately or in mixtures. After a few years quackgrass, bluegrass, whiteclover, and black medic invade and become an important part of the hay crop. Alfalfa is sometimes seeded, but a stand does not survive many seasons. At intervals a meadow is plowed and cropped to small grains or, occasionally, to peas for a year or two before it is reseeded to hay. The proportion of hay to cultivated crops and the frequency of plowing vary. Generally, areas that have inadequate water supplies are used more for cultivated crops than others. On the small tracts near Hamilton, truck crops and small fruits are grown. A few of the old apple orchards remain.

Bass coarse sandy loam, sloping (Bh).—This soil occurs on slopes of 5 to 9 percent. It is associated with Bass coarse sandy loam, gently sloping, and does not differ much from it in use, management, or yields. The erosion hazard is a little higher but it is still not serious.

Bass coarse sandy loam, strongly sloping (Bk).—This soil occurs on the higher parts of the fans and on their eroded edges where slopes range from 9 to 15 percent. It is more variable than the other phases of Bass coarse sandy loam. Spots of other soils are included in the mapping unit. The most common use is pasture. Some areas are used for hay. Yields are somewhat lower than on the sloping and gently sloping phases, and the meadows are not plowed as often.

Bass cobbly coarse sandy loam, gently sloping (Ba).—This soil occurs on high benches on the west side of the valley, in association with Blodgett soils and other Bass soils. The areas are generally smooth and relatively easy to irrigate. Slopes range from 2 to 5 percent. The surface soil contains enough cobblestones so that it cannot be cultivated readily unless the stones are removed. In most places, at least some of the cobblestones must be removed before meadows can be satisfactorily mowed.

Most areas of this soil have been cleared and cultivated, but current practice is to leave them in peren-

nial mixed hay as much of the time as possible. Most meadows are predominantly timothy, quackgrass, bluegrass, and clovers. Yields are about as high as on the Bass coarse sandy loams and Bass gravelly coarse sandy loams.

Bass cobbly coarse sandy loam, sloping (Bb).—This soil occurs in association with Bass cobbly coarse sandy loam, gently sloping, but on slightly steeper topography. Slopes range from 5 to 9 percent. Profile characteristics are similar to those of the gently sloping phase. Use and management are similar, and yields are about the same. The hazard of erosion is somewhat greater but not serious.

Bass cobbly coarse sandy loam, strongly sloping (Bc).—This soil occurs on the eroded edges of the smoother fans and on the higher, more steeply sloping fans. The slope range is from 9 to 15 percent. This soil is associated with other phases of Bass cobbly coarse sandy loam, but the surface soil generally is somewhat thinner and the profile is more variable.

Most of this soil is used for dryland or irrigated pasture. The smoother and more nearly stone-free areas may be used for hay meadows on farms that do not have land better suited to this use.

Bass gravelly coarse sandy loam, gently sloping (Bd).—This soil occurs on the smoother parts of high fans on the west side of the valley. Slopes range from 2 to 5 percent. The lay of the land is generally favorable for irrigation. However, the gravel and cobbles in the surface layer interfere somewhat with plowing. Most areas under cultivation have been cleared of stones.

This soil is used primarily for general livestock farming. Mixed hay is the principal crop. The species most commonly planted are red clover, alsike clover, timothy, orchardgrass, and smooth bromegrass. After a few years quackgrass, bluegrass, whiteclover, and black medic invade the hay stands and become an important part of the crop. Where there is a good supply of irrigation water, meadows are plowed up only infrequently. Once plowed, they are cultivated only long enough to kill the perennial vegetation and are then reseeded to hay. The crop grown is usually one of the small grains. A few of the old apple orchards remain on this soil. Near Hamilton some of the farmers on small tracts produce small fruits and truck crops.

Bass gravelly coarse sandy loam, sloping (Be).—This soil occurs in association with Bass gravelly coarse sandy loam, gently sloping, but on slightly steeper topography. Usually it is near the edges of the fans, where geologic erosion has occurred. Slopes range from 5 to 9 percent. This soil is somewhat more gravelly and porous than the gently sloping phase. Use and management are similar to those of the gently sloping phase, except that this soil is less likely to be plowed or cultivated.

Bass gravelly coarse sandy loam, strongly sloping (Bf).—This soil occurs on the high, steeper parts of the fans and on their eroded edges. Slopes range from 9 to 15 percent. It is a little more gravelly than Bass gravelly coarse sandy loam, sloping.

Most of this soil is used for dryland or irrigated pastures and hay meadows. Only the smoother and more easily managed fields are plowed regularly. Irrigating when the land is fallow may cause the finer soil particles to wash away. Yields of hay are usually lower than on the sloping and gently sloping phases.

Bass-Ravalli Complex

This complex occurs on the west side of the Bitterroot Valley, mostly near the edges of the fans where geologic erosion has taken place. The soils have developed in strongly weathered granitic outwash of varying depth, which overlies fine-textured Tertiary materials. Where the granitic materials are more than 3 feet thick, the soils are similar to Bass coarse sandy loam. In the spots where the Tertiary materials are near the surface, a claypan soil that is like Ravalli loam has developed.

The profile of the Bass loam in this complex is similar to the profile described under the Bass series. A profile of the Ravalli loam typical of this complex follows:

A_1 0 to 6 inches, light-gray (dry) to very dark gray (moist) friable heavy loam; strong platy structure where undisturbed; gravel and cobblestones are scattered on the surface and in the soil; moderately acid.

B_2 6 to 12 inches, brown (dry) to very dark brown (moist) plastic clay loam; strong coarse columnar structure; material is distinctly lighter in color when crushed; in some areas color is gray rather than brown.

B_{3ca} 12 to 20 inches, white (dry) to light brownish-gray (moist) clay loam; weak subangular blocky structure; calcareous; may contain crystals of gypsum; moderately alkaline.

C 20 to 36 inches, more or less weathered, usually unconsolidated, Tertiary silts and clays.

The characteristics of this complex vary considerably from one spot to another. The soils having Bass profiles or profiles intermediate between Bass and Ravalli are generally permeable and have good physical characteristics. The spots of Ravalli loam are sticky and difficult to work. They absorb water very slowly, if at all.

Bass-Ravalli loams, gently sloping (Bl).—This complex occurs on the upper parts of the fan edges and on remnants of old terraces. Slopes range from 2 to 5 percent.

Most areas are used for mixed hay or pasture. Management is similar to that of Charlos loam, gently sloping. If this complex is overirrigated, bog spots are likely to develop in the Ravalli soils.

Bass-Ravalli loams, sloping and strongly sloping (Bm).—This mapping unit is of small extent. All of it occurs on the edges of fans on the west side. Slopes range from 5 to 15 percent. The soils are more variable than Bass-Ravalli loams, sloping, and are cobbly in places. Many of the areas are not irrigated and are used for dryland pastures. Others are irrigated for pasture. A few irrigated areas are used for mixed hay. They are rarely cultivated. Yields are lower than on those areas of Bass soils that were mapped separately.

Bitterroot Series

The Bitterroot soils are relatively cobble-free, moderately deep, brown soils that have substrata of brown fragmented sandstone or siltstone. They are associated with Amsterdam, Burnt Fork, and Ravalli soils on the east-side benchlands. Bitterroot soils usually occur on long smooth slopes that are about parallel to the bedding planes of the underlying formations. These soils are productive if irrigated. Both surface drainage and internal drainage are good, but overirrigation may cause temporary waterlogging. Typical Bitterroot soils occur northeast of Corvallis.

Soils of the Bitterroot series occur at elevations below 4,000 feet. The annual precipitation is less than 14 inches. The native vegetation is bunchgrasses, sagebrush, and associated plants. These soils have developed from weakly consolidated sandstones and siltstones, which include what is locally called "softrock." Unlike the Ravalli soils, the Bitterroot are normally developed soils with friable subsoils. Bitterroot soils differ from Amsterdam soils in containing sandstone fragments in quantities that increase with depth. They differ from Burnt Fork soils in being free from cobblestones and less calcareous.

Profile of Bitterroot silt loam:

A_1 0 to 8 inches, grayish-brown (dry) to very dark grayish-brown (moist) loam; crumb structure; friable; neutral or slightly alkaline.

B_2 8 to 14 inches, pale-brown (dry) to brown (moist) clay loam or heavy silt loam; medium irregular blocky structure; friable; alkaline, no free lime carbonate except in crusts on the lower sides of the rock fragments.

C_{ca} 14 to 20 inches, very pale brown (dry) to brown (moist) silt loam; contains fragments of unweathered sandstone; no definite structure but breaks out in irregular blocky lumps; friable; calcareous.

D 20 to 32 inches, white (dry) to pale-brown (moist) loamy material filling the crevices and structure seams of partly weathered sandstone; calcareous.

The parent materials are weathered to depths of between 24 and 42 inches. This part of the soil profile is permeable and has good water-holding capacity. At greater depths, the material is broken and porous enough to let excess irrigation water drain away, but it retains some moisture for plant use. However, overirrigation should be avoided. Native fertility is comparatively high. Because the soils are uniformly silty, they are very likely to erode. Some areas include scattered spots of Haccke soils.

Bitterroot soils occur in the general farming sections on the east side of the valley. Most of the farms in this part of the Area are balanced units that include livestock, small grains, legume hays, irrigated pastures, and cash crops such as peas, truck crops, or small fruits. Very few apple orchards remain. Fields of Bitterroot soils are easily fitted into cropping plans because the soils have few limitations.

Bitterroot silt loam, level (Bn).—Most areas of this soil are on the lowest benches, below irrigation canals. Plenty of water is generally available during the whole irrigation season. Slopes are less than 2 percent. The areas are used for all crops commonly produced on the east side of the valley, including sugar beets. Even though this soil is nearly level, it may erode if irrigation water is not controlled carefully.

Bitterroot silt loam, gently sloping (Bo).—This soil occurs on slopes of 2 to 5 percent, mostly on benches higher than those on which Bitterroot silt loam, level, occurs. The supply of water may be somewhat limited during the peak irrigation season in some years. These soils are very likely to erode if improperly irrigated when much of the surface is bare. They are used for all the common crops except those that require intensive cultivation, such as sugar beets.

Bitterroot silt loam, sloping (Bp).—This soil occurs on slopes of 5 to 9 percent. It is used in about the same manner as Bitterroot silt loam, gently sloping. However, the hazard of erosion is much greater, and average yields are a little lower. Intensively cultivated crops are seldom grown except on small truck or garden patches.

Bitterroot silt loam, strongly sloping (Br).—This soil occurs on slopes of 9 to 15 percent. It is somewhat shallower over unweathered siltstone and sandstone than the more gently sloping phases of Bitterroot silt loam. In some areas the surface layer has been thinned by erosion. This soil is used mostly for hay crops and pasture.

Bitterroot-Burnt Fork Complex

This complex consists of moderately deep and deep, brown cobbly loam soils that are high in natural fertility and have good physical characteristics. In the lower horizons, there are concentrations of free lime. Under irrigation these soils are productive, but cobblestones in the surface soil interfere with cultivation. The principal areas of this complex are below the Bitterroot Irrigation District canal and the other high ditches on the east side of the main valley. The areas in the Birch Creek drainage system, northeast of Corvallis, are characteristic.

The Bitterroot-Burnt Fork complex occurs on gentle to rolling benches and slopes that have good surface drainage and good internal drainage. The soils have developed in shallow, highly calcareous, friable, cobbly deposits of gravelly sandy loam to heavy loam. These deposits overlie stratified beds of consolidated and unconsolidated fine earths of Tertiary Age. Most areas are on slopes that lie unconformably on the Tertiary beds, so that depth to consolidated material varies. The native vegetation was grass and sagebrush. The normal annual precipitation is 12 to 14 inches. Profile characteristics are given in the series descriptions for the two soils as mapped separately.

The two soils are of about equal extent in the complex. Their pattern of occurrence may be banded or irregular. In many places, there is a gradual transition from one soil to the other, rather than an abrupt change. In general the soils absorb water readily and hold enough to support crops. Some spots may become temporarily seeped as a result of overirrigation. Otherwise, the fields respond uniformly to treatment. These soils cannot be used to best advantage until stones are removed.

Bitterroot-Burnt Fork cobbly loams, gently sloping (Bs).—This mapping unit is generally less cobbly than the more strongly sloping phases of the complex. It occurs mostly on remnants of the original bench levels or on very gently beveled edges. Slopes range from 2 to 5 percent. Use and management practices are similar to those for Burnt Fork cobbly loam, gently sloping. The cobblestones are a nuisance, but they do not prevent cultivation. Where possible these soils are used for hay and pasture rather than for cultivated crops. On farms where less cobbly land is not available, they may be used for cultivated crops, principally the small grains and peas, grown in rotation with alfalfa and perennial pastures.

Bitterroot-Burnt Fork cobbly loams, sloping (Bt).—The general description of the Bitterroot-Burnt Fork complex describes this mapping unit. Slopes range from 5 to 9 percent. Use and management practices are about the same as for Bitterroot-Burnt Fork cobbly loams, gently sloping, except that these soils are kept in hay and pasture more of the time. Alfalfa is the preferred hay crop. Perennial pastures may consist of seeded pasture mixtures or runout hay stands. Yields are only a little lower than on the gently sloping phase. Dryland areas are used only for pasture.

Bitterroot-Burnt Fork cobbly loams, strongly sloping (Bu).—This mapping unit occurs mostly on the sides of local drainage valleys. Slopes range from 9 to 15 percent. Although the soils contain many coarse fragments, a few areas have been seriously eroded as a result of careless irrigation of fallow land.

These soils are chiefly in pasture or hay crops. Because they are so hard to cultivate, many alfalfa fields are left in hay long after the alfalfa has been almost entirely replaced by grass. Several areas are not irrigated but are used for dryland pasture.

Bitterroot, Wemple, and Ravalli Soils

A typical Bitterroot profile is described under the Bitterroot series. A profile of Wemple soil is described under the Wemple-Bitterroot-Ravalli complex. The Ravalli soil in this group is like that described in the Burnt Fork-Ravalli complex.

Bitterroot, Wemple, and Ravalli soils, shallow, moderately steep and steep (Bv).—This mapping unit is an undifferentiated group of soils that occur on bench edges, chiefly on the east side of the valley. Slopes are steeper than 15 percent. The soils were derived from the same parent materials as other Bitterroot, Wemple, and Ravalli soils but are generally not so well developed. Some areas are steep and broken and have numerous rock exposures. The areas are used only for grazing.

Blodgett Series

The Blodgett soils are moderately dark colored, medium acid, and gravelly. They occur on the west side of the valley on the higher and older fans and slopes. They have developed from weathered granitic outwash, mostly gravel and cobblestones. The normal annual precipitation ranges from 12 to 15 inches. The vegetation was that of grassy parks or sparsely timbered areas. Slopes range from gentle to steep. Surface drainage is good. Except for local spots that may become seeped from overirrigation, underdrainage is good to excessive. The soils are only moderately productive and tend to be droughty.

The Blodgett soils have moderately thick, moderately dark colored surface soils, moderately thick weakly coherent subsoils, and substrata of loose weathered granitic material. The entire profile is medium to slightly acid. The Blodgett soils are coarser textured and more permeable than the Bass soils. They have much thicker and darker colored A_1 horizons than the Como soils.

Blodgett soils are permeable to moisture, roots, and air. Their capacity to hold moisture for plants is low. The erosion hazard is serious only on the steeper slopes. The soil is moderately high to low in fertility, but it will respond to liberal applications of barnyard manure, green manure, and commercial fertilizers.

Profile of Blodgett coarse sandy loam:

A_1 0 to 8 inches, grayish-brown (dry) to very dark gray (moist) friable coarse sandy loam; moderate fine crumb structure; moderate organic-matter content; medium acid.

B 8 to 15 inches, pale-brown (dry) to brown (moist) very friable coarse sandy loam.

C_1 15 to 28 inches, pale-brown (dry) to yellowish-brown (moist) loose gravelly coarse loamy sand; contains scattered weathered cobblestones.

C_2 28 to 42 inches, weathered loose loamy gravel and cobblestones derived from granite.

On smooth fans south of Bass Creek the parent material is underlain abruptly at depths of 3 to 4 feet by finer textured, less permeable material. In other areas the profile may be shallower and the substratum may be full of cobblestones. In some places cobblestones are scattered liberally on the surface.

Blodgett coarse sandy loam, gently sloping (B2c).—This soil occurs mostly on long smooth fans south of Bass Creek. Slopes are from 2 to 5 percent. This is one of the better soils of the Blodgett series. Most of it is irrigated with water from the side creeks. Not all areas have enough water for late-season needs.

The most common crop in the irrigated areas is mixed legume-grass hay. Most meadows are plowed and cultivated often enough to kill weeds and are then reseeded to hay mixtures. The cultivated crop is usually a small grain or peas. Phosphate fertilizer is sometimes used to improve the quality and increase the tonnage of hay. A few acres are used for gardens, truck crops, and small fruits. Dryland areas are used for pasture.

Blodgett coarse sandy loam, sloping (B2d).—This soil occurs on the upper parts of fans where the slopes are steeper and on the edges of fans where slopes have been altered by geologic erosion. Slopes range from 5 to 9 percent.

Irrigation water comes from the side creeks, and the late-season supply may be limited. Areas under irrigation are used and managed in about the same way as the irrigated areas of Blodgett coarse sandy loam, gently sloping, except that less of this soil is cultivated and more of it is used for pasture. Yields of hay and

pasture are about the same as on the gently sloping phase, but yields of cultivated crops average slightly lower.

A considerable acreage is not under irrigation. It is used for dryland pasture. Some of it supports thin stands of conifers that produce small amounts of timber.

Blodgett coarse sandy loam, strongly sloping (B2e).—This soil occurs on the higher and steeper parts of the fans and on the edges that slope toward local drains. It is generally more cobbly than the sloping and gently sloping phases and has thinner surface layers. Slopes range from 9 to 15 percent. The late-season supply of irrigation water is limited in some areas. Most irrigated areas are in pasture or mixed hay. They are reseeded only at long intervals. Yields are lower than on the sloping and gently sloping phases. Dryland areas are used for pasture. Some have scattered stands of conifers that produce some timber.

Blodgett cobbly coarse sandy loam, gently sloping (Bw).—Most areas of this soil occur on narrow ridge remnants or on the edges of fans where geologic erosion has occurred. Slopes range from 2 to 5 percent. Water supplies are limited in some areas. The land must be cleared of stones before it can be satisfactorily cultivated or mowed.

In irrigated areas, mixed hay and pasture are the chief crops. Cultivated crops are of minor importance. Under similar management, yields are about the same as on areas of Blodgett gravelly coarse sandy loam. Dryland areas are used for pasture.

Blodgett cobbly coarse sandy loam, sloping (Bx).—This soil occurs on the edges of fans, where geologic erosion has occurred, and on the upper parts of fans, where slopes are steeper. Slopes range from 5 to 9 percent. Water supplies are limited in some areas. Use and management are the same as for Blodgett cobbly coarse sandy loam, gently sloping.

Blodgett cobbly coarse sandy loam, strongly sloping (By).—This soil occurs on the upper, steeper parts of fans, on slopes between fan levels, and on slopes toward local drains. Slopes range from 9 to 15 percent. The supply of irrigation water may be limited in some areas.

Pasture is the chief use. Under irrigation some of the smoother areas are used for hay and occasionally are cultivated. Yields are lower than on other phases of Blodgett cobbly coarse sandy loam.

Blodgett gravelly coarse sandy loam, gently sloping (Bz).—This soil occurs mostly on remnants of the original fan surfaces. Some areas are on narrow ridges but most are parts of broad, slightly convex slopes that dip toward the central valley. Slopes are generally between 2 and 5 percent, but a few small areas on slopes of less than 2 percent have been included. Most areas receive irrigation water from the side creeks. Only those farmers who have very early water rights get enough water for the full season. Those who hold later rights are likely to be short of late-season water in many years.

Under irrigation, this soil is used for both mixed hay and cultivated crops. Alfalfa is rarely grown because of the difficulty of maintaining stands. Truck crops and small fruits are grown to some extent, and a few apple orchards remain. Mixed hay is the main crop. Newly seeded meadows are mixtures of such plants as red clover, alsike clover, timothy, and orchardgrass. In older meadows quackgrass, bluegrass, whiteclover, and black medic may have invaded the hay stand. Usually the hay is cut once a year and the meadows are grazed in the fall. Small grain may be grown, either in planned rotations or at irregular intervals. Farmers whose water supply is short are likely to cultivate more often than those who can get ample water. Dryland areas are used only for pasture.

Blodgett gravelly coarse sandy loam, sloping (B2a).—This soil is on slopes of 5 to 9 percent. It occupies the same types of topography as Blodgett gravelly coarse sandy loam, gently sloping, and also occurs on some areas that slope toward local drains. Irrigation water comes mostly from the side creeks, and the supply may be limited late in the season.

Use and management are the same as for Blodgett gravelly coarse sandy loam, gently sloping, except that less of this soil is cultivated and more of it is used for pasture. Areas that have been frequently cultivated have been damaged by erosion resulting from careless irrigation. Yields of hay and pasture are about the same as on the gently sloping phase, but yields of cultivated crops average slightly lower.

Blodgett gravelly coarse sandy loam, strongly sloping (B2b).—This soil has slopes of 9 to 15 percent. It occurs to some extent on the same types of topography as the other phases of Blodgett gravelly coarse sandy loam, but most of it is on slopes between fan levels and along local drainageways. It is more cobbly than the other phases. Irrigation water comes from the side creeks, and the late-season supply may be limited. Irrigated areas are used principally for pasture and mixed hay, both of which are reseeded only at long intervals. Yields are lower than on other phases of this soil. Farmers who have short supplies of water usually irrigate the more gently sloping fields first. Some areas of this soil are above the ditches. The dryland areas are used for pasture. A few have scattered stands of conifers.

Blodgett, Bass, and Victor Soils

Profile characteristics for these three soils are given in the separate series descriptions.

Blodgett, Bass, and Victor very stony soils (B2f).—This is an undifferentiated group consisting of very stony, nonarable soils associated with less stony Blodgett, Bass, and Victor soils. Because of the profusion of stones, only superficial examination of the soils was possible. This mapping unit is used only for pasture. It produces very little forage.

Blodgett and Bass Soils

Profile characteristics for these two soils are given in the separate series descriptions.

Blodgett and Bass soils, undifferentiated, moderately steep and steep (B2g).—This undifferentiated group of

moderately dark colored soils occurs on bench edges on the west side of the valley. The soil materials are weathered granitic cobblestones and gravel. Slopes are steeper than 15 percent. The vegetation is chiefly grass and scattered trees. The areas are too steep and broken for any use but grazing.

Breece Series

These are moderately productive, very dark colored, coarse soils that have developed in local wash. They occur on colluvial-alluvial slopes at the bases of high bench and upland breaks and on fans at the mouths of draws. The parent material is coarse sandy loam to gravelly coarse loamy sand that was derived chiefly from granite and washed from such soils as the Brownlee, Stecum, and Riverside. The principal areas are in the southern part of the main valley and in the valleys of creeks on the east side. Areas in Sleeping Child Valley are representative. Breece soils have developed under grassland vegetation. The average annual precipitation is 14 to 18 inches, but these soils receive additional moisture by runoff. Surface drainage is good; underdrainage is good to excessive.

The Breece soils have thick, very dark colored surface layers, which merge with very friable to loose, sandy and gravelly, noncalcareous subsoils and substrata. Breece soils have moderately high to high natural fertility. They are rapidly permeable but their capacity to hold moisture available to plants is moderately high. Either a large head of water or a sprinkling system is required for satisfactory irrigation. Although the hazard of erosion is not great, local flooding may damage growing crops on some areas after a heavy rainfall. Many areas of Breece soils are too small to cultivate separately and are surrounded by nontillable soils.

The Breece soils differ from the Adel series chiefly in having coarser textured, more droughty subsoils and substrata. Breece soils are darker colored than Greeley soils, and they occur on fans of more local origin.

Profile of Breece loamy coarse sand:

A_1 0 to 18 inches, dark-gray (dry) to black (moist) very friable loamy coarse sand; weak fine and medium crumb structure; plow layer is usually slightly lighter colored than the lower part; slightly acid.

B 18 to 32 inches, gray (dry) to very dark gray (moist) very friable loamy coarse sand merging into horizons above and below; noncalcareous.

C 32 to 48 inches, somewhat stratified, very friable to loose loamy coarse sand and gravelly loamy coarse sand; generally lighter colored and more yellowish than horizons above; contains coarse angular fragments, mostly granite, and generally less than 1 inch in diameter.

Areas nearest the center of the valley, from Hamilton north, have lighter-colored surface soils that are only 10 inches thick in places; a few areas are dark-colored to great depths. Surface texture varies from sandy loam to gravelly loamy coarse sand. In a few places the subsoils are slightly calcareous.

Breece loamy coarse sand, gently sloping (B2p).—This soil occurs on slopes of less than 5 percent. The supply of water available for irrigation varies with the location. In the side valleys the supply is often limited and the head is small. Below the Bitterroot Irrigation District canal and the canals that receive water from the Bitterroot River, the supply is generally plentiful.

Most of the large areas and the areas associated with other tillable soils that lie below irrigation ditches are cultivated. The soil is used for alfalfa and other hays, small grains, peas, and sugar beets, and to a limited extent for potatoes, truck crops, and small fruits. In the upper parts of the valleys of the side creeks, where livestock is important, alfalfa and other hay crops predominate. Small isolated areas that cannot be farmed conveniently are used for pasture.

Irrigation is a major management problem. This soil is so rapidly permeable that it is difficult to distribute irrigation water evenly. Unless the head of water is large, the land next to the ditch is apt to be overwatered and leached, and the land at the lower end of the run may not be watered at all. Irrigation by sprinklers would largely overcome this difficulty.

Because of uneven irrigation, yields are likely to be uneven. Reductions in yields resulting from shortage of irrigation water are much greater than would result on finer textured soils. Dryland areas are nearly all in native grass and are used for pasture.

Breece loamy coarse sand, sloping (B2r).—Many areas of this soil occur at the mouths of local draws and on narrow strips along the upper edges of the colluvial slopes. Slopes are 5 to 9 percent. The soils generally vary more than for Breece loamy coarse sand, gently sloping, and may contain local pockets of gravel.

The supply of irrigation water varies as much as for the gently sloping phase, and the same irrigation problems exist. Use and management practices are similar to those for the gently sloping phase, except that sugar beets are not grown. Yields are comparable.

Breece loamy coarse sand, strongly sloping (B2s).—This soil was mapped on slopes of 9 to 15 percent, chiefly on fans at the mouths of steep local draws in the upper parts of the valleys of side creeks. Some areas have scattered cobblestones on the surface. A few areas are of a light coarse sandy loam texture.

Most areas are used for pasture, either irrigated or dryland, but a few are used for mixed grass-legume hay and occasionally for small grains. Yields are lower than on other phases of this soil.

Breece gravelly loamy coarse sand, gently sloping (B2h).—Most of this soil is on slopes of 2 to 5 percent. A few areas are on slopes of less than 2 percent. Most areas are in or near the central valley and have somewhat lighter colored and thinner surface soils than are typical of the Breece series. The soil is coarse textured and rather droughty.

The supply of irrigation water varies. Few farmers have available enough water for satisfactory irrigation.

This soil is cultivated only irregularly. After a period of poor crops, an area may be abandoned, then later plowed and cropped again. Alfalfa and small grains are the usual crops. Yields are unpredictable; averages are low. Sprinkler irrigation would increase yields but may not be economically practical. Dryland areas are used for grazing.

Breece gravelly loamy coarse sand, sloping (B2k).—This soil occurs on slopes of 5 to 9 percent. It is coarser and more droughty than the nongravelly Breece soils. Use and management practices for cultivated areas are similar to those for Breece gravelly loamy coarse sand, gently sloping, but more of this soil is in pasture.

Breece gravelly loamy coarse sand, strongly sloping (B2l).—Most of this soil occurs on isolated fans at the mouths of steep local draws. Slopes range from 9 to 15 percent or slightly steeper. Most areas are more or less stony. In the areas in Eightmile Valley, the stones are mostly quartzite rather than granite.

This soil is used mostly for dryland grazing. The few irrigated areas are used mainly for pasture or grassy hay. Most areas are too stony or too small to be cultivated.

Breece sandy loam, level (B2m).—This soil was mapped on slopes of less than 2 percent. It occurs on the lower parts of local fans and slopes. Some areas, such as those in the lower part of Sleeping Child Valley, are like terraces. In these places the underlying material contains more rounded gravel than is normal for the Breece soils.

Because the surface layer is finer textured and holds more moisture, this soil is not quite as droughty as the Breece loamy coarse sands.

Most of the large areas of this soil, and the areas that are associated with other tillable soils and are below the irrigation ditches, are cultivated. The more common crops are alfalfa, small grains, peas, truck crops, and small fruits. Sugar beets can be produced successfully, but usually are not grown. Light, frequent irrigation is best. Where only a small head of water is available, sprinkler irrigation may be necessary for proper distribution.

Breece sandy loam, gently sloping (B2n).—This soil occurs on slopes of 2 to 5 percent in local colluvial areas. The supply of irrigation water varies.

Use and management are about the same as for Breece loamy coarse sand, gently sloping, except that this soil is less difficult to irrigate by the flood method when only a small head of water is available. Yields average a little higher.

Breece sandy loam, sloping (B2o).—This soil was mapped on slopes of 5 to 9 percent. It is of very limited extent. Use and management practices are similar to those for the Breece sandy loam, gently sloping.

Brownlee-Duffy-Ravalli Complex

This complex of very dark upland soils occurs on the east-side benches and in Sula Basin and French Basin. It consists of friable and claypan, calcareous and noncalcareous soils that have developed over weathered granitic bedrock mixed with varying amounts of sedimentary silts and clays. The silts and clays appear to include both wind deposits and alluvial deposits of the Tertiary and Pleistocene ages. Depth to bedrock normally ranges from 3 to 6 feet; the extremes are much greater. The most extensive areas are on the foot slopes of the Sapphire Mountains (fig. 5) at elevations above 4,000 feet, and in Sula Basin and French Basin. Slopes vary from about 5 percent to more than 50 percent.

The principal soils in this complex are types of Brownlee, Duffy, Ravalli, and their intergrades. They developed under the influence of grassland vegetation and a subhumid, cool climate. Precipitation averages 16 to 20 inches per year. The average frost-free growing season is less than 110 days. Surface drainage is good to excessive.

Brownlee and Duffy are the most extensive soils in the complex. Some areas may include both these soils, and others only one of them. They are characterized by moderately thick very dark colored loam surface soils, firm gritty clay loam subsoils, and friable gritty clay loam to loam substrata that grade to weathered granite. Both series have brown subsoils, but they appear "reddish brown" in comparison to other soils of the Area. The Duffy soils have a horizon of lime accumulation and are, on the average, less gritty than the Brownlee soils.

Profile of Brownlee loam:

A_1 0 to 12 inches, dark grayish-brown (dry) to black (moist) friable loam; moderate medium crumb structure; lower part may be a shade lighter in color and of weak subangular blocky structure; slightly acid.

B_2 12 to 24 inches, brown (dry) to dark-brown (moist) firm to friable gritty clay loam; moderate medium subangular blocky structure; when wet the material is sticky and slightly plastic.

B_3 24 to 36 inches, light yellowish-brown (dry) to yellowish-brown (moist) noncalcareous strongly weathered granitic material; contains some silt and clay of about loam texture.

C 36 to 54 inches, strongly weathered granite, in place; becomes less weathered with depth.

Duffy loam resembles Brownlee loam, except that the B_3 horizon and the upper part of the weathered granite are calcareous. Where the Duffy soil is most highly developed, it is white when dry and it contains a higher percentage of sedimentary material than the typical Brownlee loam.

Ravalli loam occurs in irregularly shaped spots and streaks within areas of the friable Brownlee or Duffy soils. It and closely related intergrades occupy from 15 to 30 percent of each area of this complex. The Ravalli soils mapped in this complex have darker colored and thicker surface soils than the Ravalli soils in other complexes, and are underlain by weathered granite rather than sedimentary Tertiary or Pleistocene deposits.

Profile of Ravalli loam as mapped in this complex:

A_1 0 to 6 inches, dark-gray (dry) to black (moist) friable loam; weak thick platy structure; slightly acid.

A_2 6 to 10 inches, light brownish-gray (dry) to dark-gray (moist) friable loam; moderate thick platy structure; slightly acid to medium acid.

B_2 10 to 15 inches, yellowish-brown (dry) to dark yellowish-brown (moist) very firm, very hard gritty clay; strong coarse columnar structure; surfaces of the columns are dark brown (dry) to very dark brown (moist); moderately alkaline.

B_3 15 to 20 inches, yellowish-brown (dry) to dark yellowish-brown (moist) firm gritty clay loam; well-developed angular blocky structure; no darker color on surfaces of aggregates.

Figure 5.—Rangeland on east benches, Brownlee-Duffy-Ravalli complex and Stecum soils. The dryland cultivated benches in the left background are Gird-Haccke silt loams and Cooney loam. Photo by Ernst Peterson.

C_{ca} 20 to 42 inches, pale-yellow (dry) to light yellowish-brown (moist) friable loam; contains spots and streaks of lime and salts.

C 42 to 60 inches, weathered granite in place; calcareous in the upper part but becomes less so with depth.

The thickness and the degree of development of the various horizons vary considerably from place to place. In spots, particularly in cultivated or abandoned fields, the surface layers are absent. In some places the profile is more reddish than that described. The depth to recognizable granite varies from 2 to several feet.

Response to management is variable. The Brownlee and Duffy soils and the more friable intergrades are reasonably permeable to moisture and are moderately productive, but the Ravalli soils are very slowly permeable and low in productivity. The soils are not especially erosive, but even moderate erosion is very harmful, especially to the spots of Ravalli soil.

Brownlee-Duffy-Ravalli loams, sloping (B2t).—This soil was mapped on slopes of 5 to 9 percent. It occurs on ridges and slopes that lie on bedrock and dip toward the central valley. Most areas are broad enough to be cultivated.

Many areas of this phase were plowed and farmed early in the century, when dryland farming was common, but most were later abandoned because of droughts. During World War II some of the areas on the east side of the main valley were returned to cultivation. Winter wheat is the main crop, but some spring wheat and barley are also grown. Ordinarily the areas are summer fallowed in alternate years. Unless conditions are very good it is difficult to get good yields on the spots of Ravalli soils. Recently some of the areas have successfully been seeded to crested wheatgrass and other tame perennial grasses for hay and pasture.

In Sula Basin and French Basin, few abandoned areas were ever returned to cultivation. Although one or two have been planted to tame grasses, most have been allowed to reseed slowly with native species.

Brownlee-Duffy-Ravalli loams, strongly sloping (B2u).—This soil was mapped on about the same kind of topography as Brownlee-Duffy-Ravalli loams, sloping, but on slopes of 9 to 15 percent. A few cultivated or badly overgrazed areas show marked erosion. Gullies have developed along some of the untended car and stock trails that run directly upslope. Use and management practices are similar to those for the sloping phase, but more care is needed to prevent erosion. Yields are slightly lower than on the sloping phase.

Brownlee-Duffy-Ravalli loams, moderately steep (B2v).—This soil was mapped on slopes of 15 to 25 percent. It occurs on the smoother slopes along local

drainage courses and on the steeper parts of the front slopes of the Sapphire Mountains. Where the topography is dissected, ridgetops that are too narrow or too isolated for separate management are generally included in this mapping unit. Spots of deep soils and occasional rock outcrops are also included.

Most of this soil has never been plowed. It is used chiefly for grazing cattle. Some areas were plowed in the early days. A few are still cultivated, but average yields are low and the soil is eroding rapidly. In recent years the smoother parts of several areas have been plowed and seeded to tame grasses.

Brownlee-Duffy-Ravalli loams, steep (B2w).—This unit occurs on slopes steeper than 25 percent. It includes both moderately deep and deep soils. In some places the slopes are broken by exposures of bedrock. Small areas of Shook sandy loam and Stecum soils are included.

All of this unit is in native range. The range vegetation is like that of Brownlee-Duffy-Ravalli loams, sloping, but is sparser and less uniform. Scattered pines grow on some of the rock outcrops.

Brownlee-Stecum Association

This is an association of grassland soils that have developed on weathered granitic bedrock on mountainous terrain. It consists principally of soils of the Brownlee, Duffy, Shook, and Stecum series. Brownlee and Stecum soils predominate. Although steep and long, the slopes are generally smooth and well covered with grass. Scattered conifers grow on the slopes. Rock outcrops occupy less than 10 percent of the area.

Typical profiles of the Stecum and Shook soils are given in the series descriptions for those soils as mapped separately. Profiles of the Brownlee and Duffy soils are described under the Brownlee-Duffy-Ravalli complex.

Brownlee-Stecum association, mountainous (B2x).—This mapping unit occurs on slopes steeper than 15 percent. It is used only for grazing.

Burnt Fork Series

The Burnt Fork are deep, permeable soils that are high in natural fertility and have good water-holding capacity. They developed from highly calcareous, friable, more or less cobbly deposits of sandy loam to clay loam overlying unconsolidated Tertiary formations. They occupy large areas on the smooth to rolling benchlands east of the Bitterroot River in the Hamilton-Stevensville section of the valley. They also occur locally on the west side of the valley where calcareous Tertiary formations outcrop. Typical areas are located near the Horticultural Branch Experiment Station northeast of Corvallis and on the smooth benches just east of Hamilton (fig. 6).

The Burnt Fork soils have developed under grass. The average annual rainfall is 11 to 13 inches. They are normally developed soils that have no claypan or hardpan horizons. Pebbles and cobblestones are scattered on the surface and throughout the profile. Some types contain enough stones to interfere with tillage.

The Burnt Fork soils differ from the Willoughby soils in having permeable, rather than lime-cemented, substrata. They have much more coherent and calcareous substrata than the Riverside soils.

A_p 0 to 8 inches, grayish-brown (dry) to very dark grayish-brown (moist) friable loam; fine to medium crumb structure; a few pebbles and cobblestones scattered on the surface and through the soil; moderate organic-matter content.

B_2 8 to 15 inches, pale-brown (dry) to brown (moist) friable loam; weak medium subangular blocky structure; noticeable gravel and cobblestone content; clear transition to the C_{ca} horizon.

C_{ca} 15 to 24 inches, white (dry) to very pale brown (moist) friable loam; massive; very highly calcareous; gradual transition to C horizon.

C 24 to 38 inches, massive highly calcareous gravelly loam; same color as C_{ca} horizon.

The quantity of coarse fragments varies. In some places, the soil is cobbly; in others, it is nearly stone-free. The substrata vary from gravelly sandy loam to silt loam.

The surface layers are moderately thick, very dark grayish-brown loams, gravelly loams, cobbly loams, or very stony loams; the subsoils are moderately thick, brown, friable, more or less cobbly or gravelly loams to sandy loams; and the substrata are highly calcareous, nearly white, cobbly and gravelly loams or sandy loams which extend to depths of at least 3 feet. With increasing depth, the quantity of pebbles and cobblestones decreases, either gradually or abruptly. The soils are deep, moderately permeable, and well drained. They have high moisture-holding capacity and high natural fertility.

Burnt Fork loam, level (B3f).—Most of this soil occurs along the lower parts of the benches where slopes are less than 2 percent. Irrigation canals provide an adequate full-season supply of water in nearly all years. The soil is used for small grains, seed peas and green peas, alfalfa or clover hay, sugar beets, truck crops, small fruits, and other special crops produced in the valley. Only such areas as are needed to balance the farm enterprise are used for pasture. The use of this soil is limited only by the water supply and the few cobblestones that occur. Yields of more than 20 tons of sugar beets, 50 bushels of seed peas, 100 bushels of barley, and 5 tons of alfalfa have been reported. Such yields are obtained under very good management, including well-balanced rotations, weed control, liberal applications of manure, and the use of commercial fertilizers.

Burnt Fork loam, gently sloping (B3g).—Most of this phase occurs higher on the benches than Burnt Fork loam, level. Slopes range from 2 to 5 percent. Irrigation water is obtained from the Bitterroot Valley Irrigation District canal and other large canals. In dry years, the water supply is insufficient to meet the peak demands in July and August.

This soil will erode if it is irrigated by flooding when it is fallow or planted to row crops. It is slightly more cobbly than the level phase. It is suited to the same uses as the level phase but is used less extensively for sugar beets and other row crops because of the erosion hazard. If the land were irrigated by the sprinkler

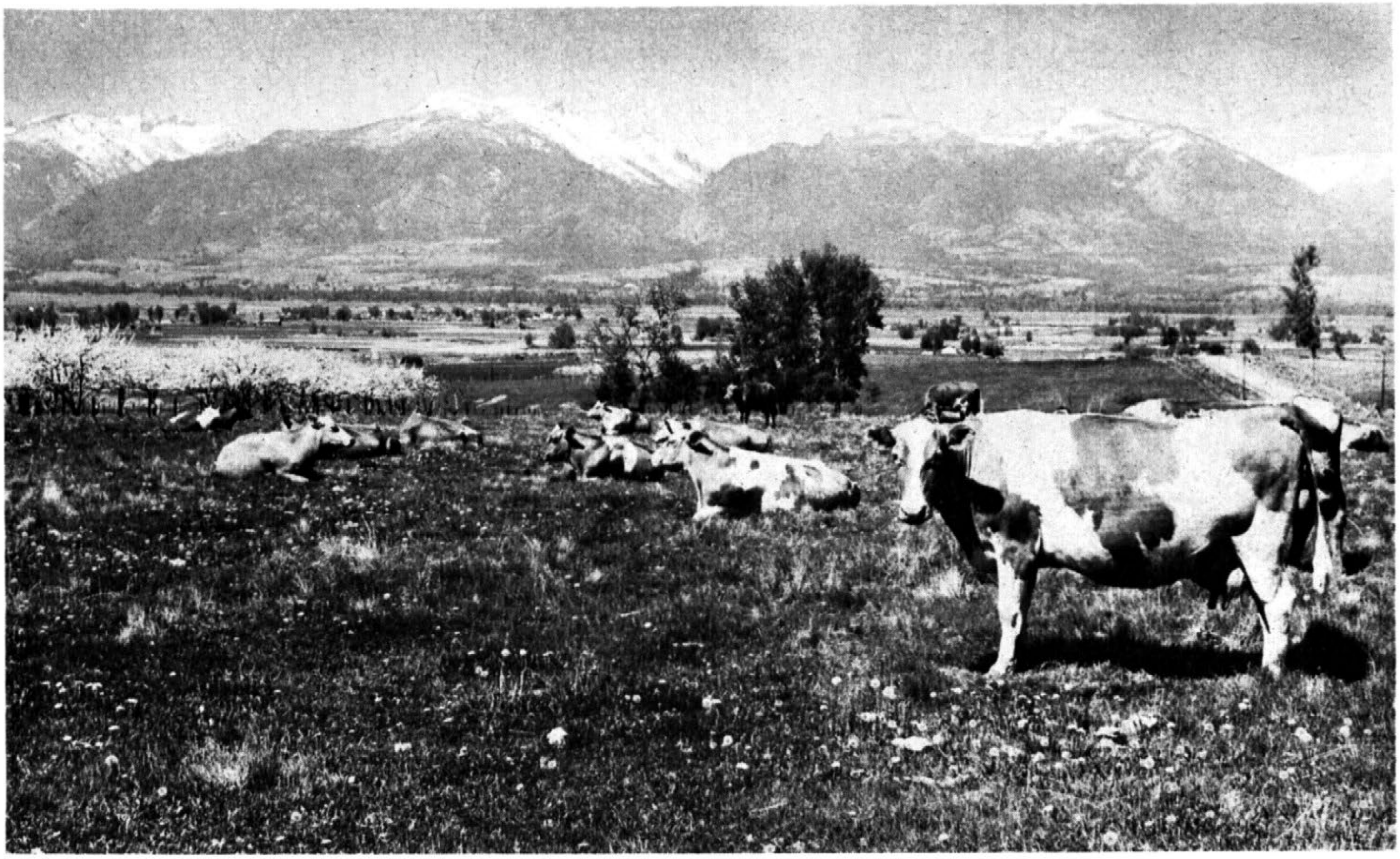

Figure 6.—Irrigated pasture on Burnt Fork loam, sloping—a part of the Burnt Fork-Riverside-Ravalli association on high benches. A remnant of the once-extensive apple orchards shows at left. The Hamilton-Corvallis-Grantsdale association and the Chamokane-Slocum association show in the central valley; the Blodgett-Bass association occupies the slope above; and the snow-capped Bitterroot Mountains are in the background. Photo by Ernst Peterson.

method, more row crops might be grown. Common crops are small grains, hay, and pasture. Some fruit and truck crops are grown. Peas and potatoes are the most common cash crops. Yields are about the same as on the level phase. Dairying is important.

Burnt Fork loam, sloping (B3h).—This soil occurs on slopes of from 5 to 9 percent. It is intermingled with Burnt Fork loam, gently sloping, and is used in about the same way. Crops that require intensive cultivation are seldom grown, except in truck patches. This soil is more likely to erode than the gently sloping phase and requires more care in irrigation. In some areas harmful erosion has already occurred. Long-time average yields are a little lower and costs of operation are somewhat higher than on the gently sloping phase.

Burnt Fork loam, strongly sloping (B3k).—This soil occurs on slopes of from 9 to 15 percent. Many areas are narrow bands along drainage courses. The surface soil is somewhat thinner and the horizon of lime accumulation is nearer the surface than in the other phases of Burnt Fork loam. Careless cultivation has caused erosion, which has made the soil even thinner in some places. Irrigation is difficult and the erosion hazard is severe in cultivated fields.

This soil is not usually cultivated very intensively. More commonly, it is used for seeded or native irrigated pasture or for mixed legume-grass hay. It is tilled only infrequently, for the purpose of renewing the pasture or meadow stand. A few areas remain in apple orchards.

Burnt Fork cobbly loam, gently sloping (B2y).—This soil has enough cobblestones on the surface and in the top layer to interfere slightly with tillage. Otherwise, it is similar to the associated Burnt Fork loam. It occurs on gently sloping or gently rolling parts of the high benches on the east side of the valley. Slopes are generally between 2 and 5 percent. A few areas have slopes of less than 2 percent.

Under irrigation, this soil is used mostly for alfalfa, small grains, and pastures. Peas, potatoes, and other crops may be grown in the less cobbly areas. Small fields are used for truck crops, after stones are removed. Yields are about equal to those on the Burnt Fork loams but tillage is more difficult because of the cobblestones. Dryland areas are used for grazing.

Burnt Fork cobbly loam, sloping (B2z).—This soil occurs on slopes of 5 to 9 percent. Irrigated areas are used for the same crops as are grown on Burnt Fork cobbly loam, gently sloping. Yields are about as high, but tillage and management are a little more difficult. Much of this soil is used for perennial irrigated pastures and mixed legume-grass hay.

Burnt Fork cobbly loam, strongly sloping (B3a).—

This soil occurs on slopes of 9 to 15 percent, often in narrow bands along drainage courses. It has a somewhat thinner surface soil and is shallower over the horizon of lime accumulation than the other phases of Burnt Fork cobbly loam. Accelerated erosion has made the surface layer even thinner in a few places.

This soil is not usually cultivated intensively under irrigation. More commonly, it is used for seeded or native irrigated pasture or mixed legume-grass hay. Tilled crops are planted only frequently enough to prepare the soil for new seedings of desirable pasture plants. Some pastures are irrigated only with waste water or not at all. Dryland areas are used for range.

Burnt Fork gravelly loam, level (B3b).—This soil occurs on the east side of the valley on terracelike bench remnants. Slopes are less than 2 percent. Most farms that include areas of this soil are of the general-livestock type. Dairying, with beef production as a sideline, is the chief livestock enterprise on most farms. Poultry, sheep, or hogs may also be raised. The principal crops are small grains, legume hays, and pasture. Seed peas, sugar beets, fruit, and truck crops are of minor importance. This soil is normally a part of the rotation cropland. Yields are only a little lower than those on Burnt Fork loam, level. However, cultivation is a bit more difficult. The dryland areas are used for pasture.

Burnt Fork gravelly loam, gently sloping (B3c).—This soil occurs on bench remnants. Slopes are from 2 to 5 percent. Use and management practices are similar to those for Burnt Fork gravelly loam, level, and yields are comparable.

Burnt Fork gravelly loam, sloping (B3d).—This soil occurs on slopes of 5 to 9 percent, principally on the high sloping benches on the west side south of Lolo in Missoula County. Most of that part of Missoula County is occupied by fairly large farms on which beef production is the chief enterprise. This soil is used chiefly for legume hay crops, which are rotated with small grains often enough to renew good hay stands. Most of the irrigation water comes from side creeks that do not supply enough late-season water; consequently, actual average yields are lower than the potential productivity of the soil.

Areas on the east side in Ravalli County are managed in about the same way as the Burnt Fork gravelly loam, gently sloping, except that more hay and pasture crops are grown. Yields are somewhat lower. Dryland areas are used for pasture.

Burnt Fork gravelly loam, strongly sloping (B3e).—This soil occurs on slopes of 9 to 15 percent. The largest areas are on the moderately steep parts of the benches south of Lolo. Smaller areas are on the east side of the valley, on some of the bench edges that slope toward local drains.

South of Lolo, where the slopes are long and smooth, this soil is used for legume hay crops in rotation with small grains. On the east side it is used more for pasture and only the smoother, more easily managed areas are used for crops.

Burnt Fork very stony loam, gently sloping and sloping (B3l).—This is a very stony soil unsuited for any use except pasture. It was mapped as a Burnt Fork soil primarily because it was associated with other soils of the Burnt Fork series. It occurs on slopes of less than 9 percent. Only superficial examination of the profile was possible. Some areas may be more like the Riverside soils than like the Burnt Fork.

This soil is too stony to cultivate. In the irrigated sections of the survey Area, it occurs in small spots that are insignificant except as a nuisance. In the dryland sections the areas are larger and the stone content more variable. As grazing land, this soil has lower carrying capacity than other Burnt Fork soils.

Burnt Fork very stony loam, strongly sloping (B3m).—This soil is like Burnt Fork very stony loam, gently sloping and sloping, except that it is on slopes of 9 to 15 percent. It is used only for grazing.

Burnt Fork and Bitterroot Soils

Profile characteristics for these two soils are given in the separate series descriptions.

Burnt Fork and Bitterroot soils, undifferentiated, moderately steep and steep (B3n).—This undifferentiated group occurs on bench edges on the east side of the valley. It consists mostly of Burnt Fork and Bitterroot soils and of exposures of parent material. Slopes are steeper than 15 percent. The areas are suitable only for grazing.

Burnt Fork-Ravalli Complex

The Burnt Fork-Ravalli complex is an association of friable soils and claypan soils developed in more or less cobbly, calcareous, fine-earth deposits that mantle parts of the benches on the east side of the valley. The complex consists mostly of Burnt Fork soils. Intermingled with them are spots and streaks of Ravalli soils, which differ from the Burnt Fork in having a tough clay loam upper subsoil of columnar structure. The spots of Ravalli soil are locally called "clay spots," "slick spots," or "gumbo."

The typical profile of the Burnt Fork soil in this complex is similar to that described under the Burnt Fork series, except that the upper subsoil may be light clay loam rather than loam and may have a more strongly developed subangular blocky structure.

Typical profile of Ravalli loam in this complex:

A_1 0 to 7 inches, light brownish-gray (dry) to very dark grayish-brown (moist) platy loam; slightly acid to neutral.

A_2 7 to 8 inches, very pale brown (dry) to pale brown (moist) platy loam; structure particles coated with light-gray leached silt; slightly acid or neutral.

B_{21} 8 to 14 inches, claypan; pale-brown (dry) to brown (moist) compact prismatic clay loam; exterior of structure particles are one shade darker than their interiors in both the dry and moist state; neutral.

B_{22} 14 to 18 inches, yellowish-brown (dry) to dark yellowish-brown (moist) prismatic clay loam; structure less pronounced than in B_{21} horizon; interiors of structure particles are light yellowish brown (dry) and yellowish brown (moist); calcareous in the lower part.

C_{ca} 18 to 30 inches, pale-yellow (dry) to pale-olive (moist) gritty loam; massive; strongly calcareous.

C 30 to 40 inches, light-colored calcareous stratified loams and sandy loams.

The Ravalli soils absorb water slowly and consequently may not supply enough moisture to support rapid plant growth throughout the growing season. Especially in areas where subsoil material has been brought to the surface by plowing, a crust may form that will interfere with plant growth. The natural fertility of the Ravalli soils is only moderate. The Burnt Fork soils are permeable to a depth of 4 feet or more. They absorb water readily and have high water-holding capacity. They are comparatively high in natural fertility. Neither the Ravalli nor the Burnt Fork soils are highly erodible.

The mapping unit also includes some soils that are intermediate in characteristics between the Burnt Fork and the Ravalli soils. Some spots are nearly as gravelly as the Riverside soils. Generally the soils that make up the complex occur in bodies too small to be farmed separately. Response to management may vary, even within one field.

Burnt Fork-Ravalli loams, level (B3s).—This mapping unit occurs mostly on terracelike parts of the east-side benches that parallel Threemile Creek and other major side creeks. Gravelly lenses in the subsoil and substratum are more common than in the other phases of Burnt Fork-Ravalli loams.

Irrigated areas are used chiefly for alfalfa, red clover, mixed hays, small grains, and perennial pastures. Seed peas and green peas are sometimes produced as cash crops. In very favorable years yields may be as high as on the Burnt Fork loams, but long-time averages are lower. Most farms are general livestock or dairy farms. Only a few apple orchards remain, and few truck crops are produced. Hay is the principal crop. If the soil is moistened to field capacity in the spring, a good first cutting, fairly uniform in yield and quality, will usually be obtained. The second cutting may vary in yield and stage of growth as the soil varies, but not enough to cause harvesting difficulties.

In some years it is difficult to start new stands of hay on this soil; consequently, hayfields are not plowed as long as the stands remain fairly good. Some farmers prefer to use runout fields for pasture rather than to plow immediately. When the hayfields are plowed, they are usually planted to small grains or peas. Two or three crops may be grown before a field is reseeded to hay. Available manure is applied for one of these crops. Some farmers have been able to improve the more noticeable spots of Ravalli loam by applying extra manure and commercial fertilizer.

Some of the dryland areas are used for wheat or barley under an alternate crop-fallow system. Most of the unirrigated areas, however, do not have enough rainfall to sustain production.

Burnt Fork-Ravalli loams, gently sloping (B3t).—These soils occur on slopes of 2 to 5 percent on benches on the east side of the valley. They are used and managed in the same way as the level Burnt Fork-Ravalli loams.

Burnt Fork-Ravalli loams, sloping (B3u).—This unit occurs on slopes of from 5 to 9 percent. It may erode if carelessly irrigated. A few areas are already eroded. Tilled fields should not be irrigated until a good plant cover is established. Otherwise, this unit is used in about the same way as Burnt Fork-Ravalli loams, level.

Burnt Fork-Ravalli loams, strongly sloping (B3v).—These soils are somewhat thinner than other phases of the Burnt Fork-Ravalli complex and have been further reduced, in places, by erosion caused by careless cultivation. Slopes range from 9 to 15 percent. Most of these soils are in perennial pastures. The rest are managed in the same way as the level phase of Burnt Fork-Ravalli loams.

Burnt Fork-Ravalli cobbly loams, gently sloping (B3o).—This unit occurs on parts of the benches on the east side of the valley. Slopes range from 2 to 5 percent. The soils resemble the associated Burnt Fork-Ravalli loams, except that they contain enough cobblestones to be troublesome. Although rocks have been picked from many of these areas, more are exposed each time the soils are plowed. However, the cobblestones do not actually prevent cultivation.

Many areas of this unit are used for the same crops as areas of Burnt Fork-Ravalli loams, level, and are managed in the same way, except that more frequent rock-picking is necessary. Average yields are about the same. It is customary to use as much of the cobbly loams as possible for perennial pasture. The land is seldom broken for dryland cultivation.

Burnt Fork-Ravalli cobbly loams, sloping (B3p).—This mapping unit occurs on slopes of 5 to 9 percent on the east-side benches. It is associated with other phases of the Burnt Fork-Ravalli complex. It has about the same range in use and management as Burnt Fork-Ravalli loams, level, but because it is steeper and more cobbly, it is used mostly for irrigated or dryland pasture.

Burnt Fork-Ravalli cobbly loams, strongly sloping (B3r).—This unit occurs on slopes of 9 to 15 percent. It is used in the same way as Burnt Fork-Ravalli cobbly loams, sloping.

Burnt Fork-Ravalli Complex, Arkosic Variants

This complex is made up of friable soils and claypan soils developed on sandy and gravelly local wash derived from weathered granitic bedrock or gravels. It occurs on the east side of the valley at the lower elevations. Typical areas are in the Willow Creek community. This complex differs from the normal Burnt Fork-Ravalli complex chiefly in being derived from predominantly granitic material, in having much looser and more gravelly substrata, and in being less calcareous.

A profile of the more friable soil—Burnt Fork loam. arkosic variant—is as follows:

A_p 0 to 8 inches, light brownish-gray (dry) to dark grayish-brown (moist) friable but somewhat sticky gritty loam; moderate crumb structure; generally contains a scattering of coarse gravel and an occasional cobblestone; mildly alkaline.

B_2 8 to 15 inches, light yellowish-brown (dry) to yellowish-brown variegated with brown (moist) sticky clay loam; well-developed subangular blocky structure; aggregates are hard when dry; moderately alkaline.

B_{3ca} 15 to 22 inches, white (dry) to pale-yellow (moist) sticky loam to gravelly loam; weak subangular blocky structure; moderately alkaline and calcareous.

C 22 to 36 inches, white (dry) to pale-yellow (moist) sticky sandy loam or gravelly sandy loam that grades rapidly to gravelly loamy sand that was derived largely from weathered granitic material; moderately alkaline; free lime may be present.

D 36 inches +, weathered granite in place, or unconsolidated Tertiary sediments that vary in texture from gravel to loam.

In some places the profile is not calcareous. Ravalli loam, arkosic variant, as it occurs in this complex, is similar to Ravalli loam as it occurs in the complex of Burnt Fork-Ravalli loams. It is of minor importance. Most of the complex is composed of Burnt Fork loam, arkosic variant, and profiles intermediate between it and the Ravalli soil. The loose sandy and gravelly upper substratum of this mapping unit has only moderate moisture-holding capacity. The heavier spots do not absorb water readily during the growing season. Natural fertility is only moderate. The complex soil pattern may cause grain to ripen unevenly and yields to vary.

Burnt Fork-Ravalli loams, arkosic variants, gently sloping (B3w).—This soil occurs on the lower parts of the slopes, generally below steeper phases of the same complex. Slopes range from 2 to 5 percent. The chief crops are alfalfa or other legumes grown for hay, small grains, and occasionally a crop of peas. Some areas are used for perennial irrigated pasture. Yields vary considerably from year to year.

Burnt Fork-Ravalli loams, arkosic variants, sloping (B3x).—This soil occurs on alluvial slopes and fans below granitic bedrock uplands and Tertiary benches of granitic gravel. Slopes range from 5 to 9 percent and are steep enough to erode if carelessly irrigated. Use and management are about the same as for the gently sloping phase, with which this soil is associated. Yields are comparable.

Burnt Fork-Ravalli loams, arkosic variants, strongly sloping (B3y).—This unit occurs on the upper edges of the alluvial fans, where they merge with the uplands or bench edges. The colluvial material is generally somewhat thinner than in the other phases, and the soils generally vary more. Slopes range from 9 to 15 percent.

Most areas are in irrigated or dryland pasture. Some are used for hay and occasionally for small grains. Yields are lower than on the less steeply sloping phases. The danger of erosion resulting from careless irrigation is much greater.

Burnt Fork and Riverside Loams, Imperfectly Drained (Seeped)

This unit is an undifferentiated group of dark, loamy, more or less gravelly or cobbly soils, which are kept wet by seepage from higher lying lands and from canals. It occurs on benches on the east side of the valley. The soils in this mapping unit are wet spots within areas of Burnt Fork loam and cobbly loam; Riverside loam, sandy loam, gravelly sandy loam, and cobbly sandy loam; Cooney cobbly loam; and Ravalli loam and cobbly loam. Saline or unusually wet spots are shown on the map by special symbols.

The seeped phases are like the normal phases of these soils, as described under each series, except that they have strong-brown and yellowish-brown stains and mottlings and in some places accumulations of salts. The deep underlying formations are impervious and lie at such an angle that they deflect surplus subsurface water from higher lying areas. In addition, surplus water seeps from canals or from overirrigated areas at higher elevations. The degree of wetness varies somewhat from area to area and year to year, but all areas are usually too wet for most crops commonly grown in the valley. Many spots have gravelly horizons, but even these spots are not adequately drained because the gravel is not thick enough and is not continuous. The most effective method of drying up these soils would be to cut off the water at its source. Usually, however, the land is worth more as subirrigated pasture than it would be if drained and cultivated.

Burnt Fork and Riverside loams, imperfectly drained (seeped), level and gently sloping (B3z).—This unit occurs on slopes of less than 5 percent. Most of the areas are gentle sags within areas of normal Burnt Fork or Riverside soils. Many are at the heads of drainage courses. They do not have gravelly or cobbly surface soils. Most areas would be good for cultivation if it were not for the seepage.

Although a few of the less wet areas and the fringes of many others are cultivated or used for mixed hay, most of this unit is in perennial pastures. The principal vegetation is bluegrass, white clover, alsike clover, and sedges. A few extremely wet spots support only sedges and rushes. Scattered saline spots are nearly bare. Forage production is high.

Burnt Fork and Riverside loams, imperfectly drained (seeped), sloping and strongly sloping (B4a).—This unit occurs on the more steeply sloping parts of the benches and on slopes along local drainageways. Some areas, but not all, are sags. Slopes range from 5 to 15 percent.

Almost all areas are in perennial pasture. The vegetation is the same as that on the gently sloping phase, and the carrying capacity is about as high.

Burnt Fork and Riverside loams, imperfectly drained (seeped), moderately steep (B4b).—This unit is on slopes steeper than 15 percent. Most areas are below the larger canals and are watered by leakage. The exact size and shape of the areas varies somewhat from year to year. Most of the areas are underlain by Tertiary formations, but some are underlain by granite or pre-Cambrian quartzites, sandstones, and limestones. Most areas are more or less cobbly or gravelly on the surface.

Perennial pasture is the only use. The vegetation is the same as on the other phases. Production is comparatively high.

Castner Series

The Castner soils are shallow and are not suitable for cultivation. They occur on ridges and rough broken slopes at medium elevations on the east side of the valley. Areas along Spooner Creek are typical. The soils have developed in slightly weathered shat-

tered and broken quartzite, argillite, and hard sandstone bedrock. There is little fine earth in the profiles, and rock outcrops are common. Although these areas have moderately high rainfall, runoff is so rapid that little moisture is retained for plant growth. The native vegetation is sparse. Big sage, bitterbrush, balsamroot, and annual grasses and forbs are most common, but perennial grasses also occur. The bitterroot is prominent late in May and in June. Although they overlie similar bedrock, Castner soils are much more stony and much less well developed than Cooney or Teton soils. They differ from Burnt Fork very stony loam in having sharp-angled rather than rounded stones.

Profile of Castner stony loam:

A_1 0 to 5 inches, pale-brown (dry) to dark grayish-brown (moist) friable loam, between jumbled sharp-angled rock fragments, mostly more than 10 inches in length.

C 5 to 10 inches, transition zone consisting of very pale brown (dry) to light yellowish-brown (moist), friable, calcareous fine sandy loam, between fragments of rocks.

D 10 to 36 inches and deeper, slightly weathered broken quartzite, argillite, or sandstone of pre-Cambrian Age; contains a little fine earth in the crevices; some of the rocks may be coated with lime.

The depth to undisturbed bedrock varies considerably; bedrock may be at the surface at one point and several feet deep a few feet away. Above the Bitterroot Valley Irrigation District canal the mapping was more general, and small areas of deeper more fully developed soils, such as Cooney loam, were included.

Castner stony loam is rapidly permeable. It has a limited root zone and a very low capacity to hold moisture available to plants. It is too stony, and usually too rough, to be plowed.

Castner stony loam, sloping and strongly sloping (Cm).—This soil occurs mostly on slopes of 9 to 15 percent but in some places on slopes as gentle as 5 percent. Most of the areas are on ridges or are outcrops on relatively smooth benches. This soil is used only for grazing. It is not irrigated.

Castner stony loam, moderately steep and steep (Cn).—This soil occurs chiefly on slopes steeper than 15 percent, along drainage courses. In some places it includes bluffs of outcropping bedrock. Some north-facing slopes include colluvial slopes of fine earth, which support a good stand of grass. This soil is used only for grazing.

Chamokane Series

The Chamokane are moderately deep to shallow, well drained to somewhat excessively drained, somewhat sandy alluvial soils that have developed on the flood plains of the Bitterroot River. The parent material is more or less stratified sandy to loamy alluvium, 10 to 30 inches thick. Beneath this is loose sand and gravel of mixed origin, which has been deposited or re-sorted during recent geologic time. The more nearly typical areas are west of the Bitterroot River, and on islands between the main channels. Some areas of Chamokane soils are flooded annually, and some are rarely flooded. The principal areas are flooded only occasionally or rarely. Except during flood season, drainage is good. The native vegetation was an open stand of conifers, cottonwood, and brush, and an understory of grasses. The annual precipitation averages less than 13 inches. The soils are of too recent origin to show much difference between horizons. In contrast to Slocum soils, which are less well drained. Chamokane soils have bright-colored profiles free from mottling or other signs of poor drainage.

Profile of Chamokane fine sandy loam:

A_1 0 to 5 inches, dark grayish-brown (dry) to very dark grayish-brown (moist) friable fine sandy loam; weak crumb structure; neutral to slightly acid.

B 5 to 12 inches, light brownish-gray (dry) to grayish-brown (moist) friable to very friable fine sandy loam; neutral to slightly acid.

C 12 to 24 inches, very pale brown (dry) to pale brown (moist) weakly stratified very friable fine sandy loam and loamy fine sand; usually noncalcareous.

D 24 to 42 inches, loose sand and gravel from various rocks.

Chamokane fine sandy loam (Cb).—All of this soil is on the Bitterroot River flood plains. The slope is generally less than 2 percent. Except where the land has been smoothed or leveled, the microrelief is irregularly undulating in the island-and-channel pattern characteristic of alluvial lands. Usually the individual areas are small and irregular in shape.

This soil varies considerably. The normal range in depth to loose sand and gravel is 20 to 36 inches but, since the soil is intricately associated with both shallower and deeper soils, many areas include profiles shallower or deeper than normal. A few areas have loam surface layers. Local spots and streaks of Slocum soils are also included. The flood plain east of the main channels between Hamilton and Victor is a little higher and older than most of the flood plain, and the soils are somewhat better developed and are less likely to be flooded. Subsoils in this area may be calcareous.

Permeability is moderately rapid in the surface soil and subsoil and very rapid in the substratum. The moisture-holding capacity is low. Natural fertility is only moderately high. The porous substratum allows the water table to fluctuate considerably; during most of the year it is more than 3 feet below the surface, but it may be near the surface for brief periods. The water level in most of the areas is controlled by the rise and fall of the river; therefore it is highest in spring or early in summer. North of Corvallis, where the flood plain merges with the fans of the side creeks, the water table is affected more by irrigation and may be highest in the fall.

Dairy or general livestock farms predominate in the areas where Chamokane fine sandy loam occurs. The cultivated areas of this soil are used mostly for small grains and mixed hay. This soil is not very well suited to legumes. The stands are soon invaded by grasses, and neither alfalfa nor red clover stands can be maintained for long. Few areas of Chamokane fine sandy loam are large enough to be managed as separate fields, and the associated soils are even less well adapted to legumes.

In the Corvallis community some sugar beets are grown on this soil. A few areas are used for truck

crops and small fruits. Many tracts that are isolated by nontillable soils or for other reasons are not handy to cultivate are used for pasture. Some of the lower areas that are most likely to be flooded have not been cleared.

Chamokane gravelly loamy sand, shallow (Cc).—This very shallow gravelly soil occurs in the Chamokane-Slocum association. Some areas have 6 or 8 inches of loamy sand on the surface, but most consist mainly of sand and gravel, with which are mixed very small amounts of fine earth and organic matter.

The large areas of this soil are in pastures that have very low carrying capacities. If the surrounding soils are tillable, small areas may be farmed, but they yield very little.

Chamokane loamy fine sand (Cd).—All of this soil is on the Bitterroot River flood plains. The slope is generally less than 2 percent. The microrelief is irregularly undulating. This is a moderately deep to deep well drained to excessively drained sandy alluvial soil. It is too loose and droughty to be good for cultivation. Typical tracts are located east of Bass Crossing.

Although less extensive, Chamokane loamy fine sand has about the same distribution as Chamokane fine sandy loam. It developed from the same kind of parent material, but it has a sandier solum and a wider range in depth to loose sand and gravel. Areas deeper than 36 inches were not separated from areas of medium depth. Permeability is rapid in the surface and subsoil and very rapid in the substratum. Except for surface texture, the profile of the loamy fine sand is like that described for the sandy loam type and varies in about the same way.

Most of this soil is still under native cover or is in cutover pasture. Some has been used for growing hay or small grains, but yields are considerably lower than on Chamokane fine sandy loam.

Chamokane loamy sand-sandy loam, shallow (Ce).—This complex consists of all of the well drained and excessively drained soils on the Bitterroot flood plains that have more than 8 and less than 20 inches of loamy sand and sandy loam over the underlying loose sand and gravel. Chamokane loamy sand-sandy loam was not separated into slope phases. In general, slopes are less than 2 percent, but unless the land has been smoothed or leveled the microrelief is irregularly undulating. A few sharp breaks to drainage channels are included.

This complex also includes small tracts of the other Chamokane soils. However, the use suitability of each area is controlled by the characteristics of the two shallow soils for which this mapping unit is named. These soils are closely associated with Chamokane fine sandy loam, which is deeper over gravel. They have the same distribution and are of the same origin. The flood hazard is the same. The shallow soils, however, are more droughty and are lower in natural fertility. The moisture-holding capacity is predominantly low to very low, and permeability is rapid to very rapid. Use and management are the same as for Chamokane fine sandy loam, but yields are lower.

Chamokane complex (Ca).—This mapping unit occurs on the inner flood plains of the Bitterroot River and its tributaries. The surface is channeled and uneven. Shallow and moderately deep sandy and gravelly soils predominate. Drainage is variable. The most extensive soils in the complex are shallow gravelly types of Chamokane. Mixed with these are smaller areas of other Chamokane soils. The areas are irregularly shaped, usually elongated; they are as much as 30 rods wide and 80 rods long. They are separated by meandering intermittent streams and abandoned channels or swales, in which are developing Slocum fine sandy loam, Slocum fine sandy loam, shallow, and their poorly drained phases. Microrelief is undulating to choppy. The slope is generally less than 2 percent, except in the upper valleys, where it may be 3 or 4 percent.

Annual flooding is characteristic. North of Hamilton this complex occupies a strip averaging a mile or more in width, and it interfingers into the slightly higher levels where various Chamokane and Slocum soils are mapped separately. In the upper valleys, the complex occupies almost the entire flood plain.

This land type is not suitable for cultivation. Although some of it has been cleared and plowed, only scattered fields are now cultivated. The flood hazard, the difficulty of building permanent structures for the diversion of irrigation water, and the droughty, infertile nature of the soils are the principal obstacles to development.

Most of the Chamokane complex is on farms that are composed mainly of other soils. It is used chiefly for grazing. Some firewood and posts are harvested from it. The forest is cottonwood, willow, and western yellow pines, and the understory is shrubs, grass, sedges, and forbs. The cover varies from dense to sparse. The carrying capacity averages low, but it varies considerably from season to season and from year to year. Grazing may be good early in spring, but there is some danger of losing livestock during the annual floods that occur in May or June. In some years it is necessary to keep livestock away from these areas during this time. After high water the forage usually grows well for a time, but as the summer progresses it may become dormant. There is usually little fall grazing.

Charlos Series

The Charlos are dark-colored, slightly acid, fine-textured soils that occur on high fans on the west side of the valley. They are among the better soils of that part of the Area. The parent material is strongly weathered gritty clay loam over compacted, weathered, granitic cobblestones and boulders carried from canyons in the Bitterroot Mountains during one of the early periods of glaciation. The material is brown, but it appears "reddish brown" when compared to other soils in the Area. The principal and most nearly typical areas are on the benches at Darby, but other areas are scattered the length of the valley.

These soils have developed under grass or open conifer-grass vegetation. The normal annual precipitation is 13 to 16 inches. Except for local spots that are seeped from overirrigation of adjoining areas, underdrainage is good though slow. The resulting soils have moderately thick, dark-colored surface soils and

plastic, gritty clay loam subsoils. The Charlos soils are deeper and finer textured than the Bass soils and lack the silty upper horizons of the Sula soils. They have developed in the same kind of material as the Lick soils but have much darker colored and thicker surface soils.

Profile of Charlos loam:

A_p 0 to 8 inches, grayish-brown (dry) to very dark gray (moist) friable loam; contains some gravel and scattered cobblestones; weak granular structure; slightly acid.

B_2 8 to 18 inches, strong-brown (dry) to dark-brown (moist), firm, sticky, plastic, gritty clay; moderate coarse subangular blocky structure; slightly acid.

B_3 18 to 30 inches, yellowish-brown (dry) to brown (moist), firm, sticky, gritty clay loam; weak subangular blocky structure.

C 30 to 42 inches, strongly weathered mass of granitic boulders, cobblestones, and gravel; when moist, crushes readily to a sticky, gritty loam.

The thickness of the "reddish-brown" clay loam in which this soil has developed varies from about 24 to 60 inches. Where it is thickest and heaviest, a weak lime horizon may have developed at 30 to 40 inches. A few acres in the northern part of the valley are on Tertiary silts and clays. Most of these areas are seeped from overirrigation.

The moisture-holding capacity of Charlos soils is high to very high. Permeability of the subsoil is moderately slow. When heavily irrigated, the soils are nearly saturated during much of the growing season. Erosion is not a serious problem. Natural fertility is only moderately high, but yields can be improved by liberal applications of manure and commercial fertilizer.

Charlos loam, gently sloping (Cf).—This soil occurs on slopes of 2 to 5 percent. It occupies rather large areas on the benches at Darby, and smaller areas further down the valley on what are apparently remnants of the old bench levels. Irrigation water comes from the side creeks. Only those who hold early water rights get enough water for late-season irrigation.

Most areas of this soil are parts of general livestock farms. On some of the farms, dairying is the major enterprise; on others, beef production. Most of the old apple orchards are gone. At present the major crop is mixed hay, which is rotated occasionally with small grains. Production of special crops such as peas, small fruits, and truck crops is limited. As most farms have enough poorer soils to use for pasture, very little of Charlos loam, gently sloping, is permanently pastured.

Charlos loam, sloping (Cg).—This soil occurs chiefly on the steeper fans and around the edges of the more gently sloping fans. Slopes range from 5 to 9 percent. Use and management are similar to those for the gently sloping phase, but yields may average a little lower.

Charlos loam, strongly sloping (Ch).—This soil occurs on slopes of 9 to 15 percent. Most areas are on eroded edges and on slopes between fan levels. The parent material of "reddish-brown" clay loam is thinner, on the average, than that of the sloping and gently sloping phases of Charlos loam. In some places the soil is nearly the same as Bass loam.

This soil is used mostly for pasture and mixed hay. It is cultivated and reseeded only infrequently. The hay is more like wild hay than like the seeded mixtures. The supply of irrigation water for some areas is limited.

Charlos silt loam, level (Ck).—This soil is intermediate between Charlos loam and Sula silt loam. It occurs where the silt that is the parent material of the Sula soils is less than a foot thick over the parent material of the Charlos soils. Slopes are less than 2 percent. The principal areas are on the benches at Darby. Where the silt layer is thickest, the upper part of the subsoil is grayish-brown silt loam.

Charlos silt loam has a thicker horizon of reddish-brown clay loam than Charlos loam, and is also more likely to have a lime horizon. Underdrainage may be slightly slower in Charlos silt loam. The late-season supply of water is limited in some areas. Use and management are the same as for Charlos loam, gently sloping. Yields may be slightly higher.

Charlos silt loam, gently sloping (Cl).—This soil occurs on slopes of from 2 to 5 percent. This is a slightly better soil than Charlos loam, gently sloping, but use and management are similar for the two soils.

Chereete Series

The Chereete are light-colored, coarse, droughty soils that occur on the fan terraces of the creeks on the west side of the valley. The parent material is unweathered granitic gravel, cobblestones, and boulders washed from canyons in the Bitterroot Mountains or redeposited from older outwash during one of the late glacial stages. Areas on the fans of Onehorse Creek, west of Florence, are typical.

The soils have developed under dense coniferous timber, chiefly western yellow pine and lodgepole pine. The average annual precipitation is 12 to 15 inches.

These soils are poorly suited to cultivated crops. They are only a few feet above present stream channels. However, external drainage is good and internal drainage is excessive, except occasionally during high water in the spring. The profile is only weakly developed. Both the surface soil and the subsoil are light colored, very friable to loose, and stony. Gravel and cobblestones occur at 10 to 20 inches.

Profile of Chereete stony coarse sandy loam under forest:

A_0 1 to 0 inches, litter, the upper half undecomposed pine needles and the lower half a partially decomposed mat containing some mineral matter in the lower part.

A_2 0 to 3 inches, light-gray (dry) to dark-gray (moist) stony coarse sandy loam; contains an abundance of gravel; moderately acid.

B 3 to 14 inches, very pale brown (dry) to pale brown (moist) stony gravelly coarse sandy loam; contains a few spots and streaks of brown gritty fine earth; moderately acid.

C 14 to 30 inches, loose stones, cobbles, gravel, and sand, chiefly from granite.

Where these soils have been cultivated or cut over, the surface mulch of organic matter is absent. In some spots the entire profile is loose gravelly sand.

Chereete soils are rapidly to very rapidly perme-

able and have very low moisture-supplying capacity. They are very droughty. Natural fertility is very low.

Chereete stony coarse sandy loam, level (Cw).—This soil occurs mostly on terraces next to the Bitterroot River flood plains. Slopes are less than 2 percent. The virgin timber has been cut from most areas of this soil. A few areas are intermittently cultivated, but without much success. Complete crop failures are frequent. Most cleared areas are used for pasture. Although the pastures appear lush when green in the spring, they have very low carrying capacity even if irrigated. Many of the areas support a second growth of western yellow pine and lodgepole pine that varies from seedlings to nearly mature trees. Where the timber is dense, the undergrowth is scant and little forage is produced.

Chereete stony coarse sandy loam, gently sloping (Cx).—This soil occurs on fans along creeks on the west side of the valley. The fans are generally smooth, but the microrelief usually has the swale-and-swell topography characteristic of alluvial deposits. Slopes range from 2 to 5 percent. Use and management are the same as for Chereete stony coarse sandy loam, level.

Chereete stony coarse sandy loam, sloping (Cy).—This soil occurs on the steeper, upper parts of the fans and in areas of sharp microrelief. Slopes range from 5 to 9 percent.

Most of this soil is in second-growth timber or cleared pastures. Irrigated areas provide fair grazing early in the season, but when warm weather comes most of the forage becomes dormant.

Chereete very stony coarse sandy loam, level (Cz).—This soil occurs on slopes of less than 2 percent. It is too stony to be cultivated. There are so many round granitic stones and cobblestones on the surface that, in places, they form a stone pavement. In spots where digging is possible, the soil profile is like that of Chereete stony coarse sandy loam, with which this soil is associated.

Chereete very stony coarse sandy loam, gently sloping (C2a).—This soil occurs on slopes of 2 to 5 percent. It is not cultivated but is in second-growth timber or cleared pasture. Some areas are irrigated, but even those areas produce very little forage.

Chereete very stony coarse sandy loam, sloping (C2b).—This soil is on slopes of 5 to 9 percent. It is used and managed in about the same ways as Chereete very stony coarse sandy loam, gently sloping.

Chereete gravelly coarse sandy loam, level (Co).—This soil occurs mostly on the lower parts of fan terraces, along the creeks on the west side near the central valley. It is like the associated Chereete stony coarse sandy loam, except that it contains fewer stones and cobblestones. Slopes are less than 2 percent.

Although the stones do not interfere with plowing, this soil is too droughty and infertile to be suitable for cultivated crops. Use and management are about the same as for Chereete stony coarse sandy loam, level, but possibly a little more of the gravelly coarse sandy loam is cultivated. Yields are low.

Chereete gravelly coarse sandy loam, gently sloping (Cp).—This soil occurs on generally smooth, uneroded, gently sloping parts of fans on the west side of the valley, but it has the undulating microrelief characteristic of alluvial deposits. Slopes range from 2 to 5 percent. Use and management are the same as for Chereete gravelly coarse sandy loam, level.

Chereete gravelly coarse sandy loam, sloping (Cr).—This soil occurs on the steeper, upper parts of the fans and in areas of sharp microrelief. Slopes range from 5 to 9 percent.

Much of this soil is in second-growth timber or cleared pasture. It produces little forage. Grazing is best in the early part of the season. Cultivated areas usually do not give very satisfactory yields.

Chereete sandy loam, level (Cs, Cu).—This soil occurs chiefly on terraces of the Bitterroot River at Woodside. Slopes are less than 2 percent. This soil differs from the coarser Chereete soils in having a 10- to 15-inch top layer of sandy fine earth. This layer is relatively free of gravel and cobblestones, but it is droughty and low in natural fertility. Permeability is moderately rapid in the surface soil and subsoil and very rapid in the substratum. The capacity to hold moisture available to plants is low to very low. The soil is easily tilled, and the lay of the land is generally favorable for irrigation.

Where this soil adjoins the Slocum and other imperfectly drained soils, the water table may be within 2 or 3 feet of the surface for part of the year, and the substratum is generally mottled with browns and yellowish browns. The texture of the surface soil varies from sandy loam to fine sandy loam.

Most of this soil has been cleared, and much of it is cultivated. The chief crops are small grains, mixed hay, and perennial pasture.

Chereete sandy loam, gently sloping (Ct, Cv).—This soil occurs on terraces and fans on the west side of the valley. Slopes range from 2 to 5 percent. The soil is used in the same way as Chereete sandy loam, level.

Clark Fork Series

The Clark Fork are yellowish-brown or brown droughty soils that occur on low terraces, chiefly near and south of Darby. The parent materials are unweathered gravels and cobblestones mixed with some fine earth, chiefly fine and very fine sand, in the upper 15 to 30 inches. They were derived from granite, gneiss, rhyolite porphyry, and quartzite. They were deposited as alluvium toward the end of the glacial period and now form low terraces well above overflow.

These soils have developed under dense coniferous forest in which western yellow pine and lodgepole pine are the chief species. The normal annual precipitation ranges from 16 to 18 inches. Level to gentle slopes predominate. Surface drainage is good and underdrainage is excessive. Natural fertility is low.

The most prominent characteristics of the soil profile are the yellowish-brown or brown colors of the subsoil when moist, the very thin moderately dark colored surface layer, the lack of medium and coarse sand in the fine earth fraction, and the fresh unweathered appearance of the parent material. The entire profile is slightly to moderately acid. Clark Fork soils have much browner subsoils and darker

colored surface layers than the Chereete soils, which developed in similar kinds of gravel on fans farther north on the west side of the valley. They have much thinner surface layers and coarser textured subsoils than Victor soils.

Virgin profile of Clark Fork fine sandy loam:

A_0 1 to 0 inches, pine-needle litter, partly decomposed.

A_1 0 to 3 inches, brown (dry) to very dark grayish-brown (moist) very friable fine sandy loam; weak fine crumb structure; contains scattered pebbles and cobblestones; slightly acid.

B_2 3 to 10 inches, light yellowish-brown (dry) to yellowish-brown or brown (moist) very friable fine sandy loam; very weak subangular blocky structure; medium acid.

C 10 to 18 inches, very pale brown (dry) to light yellowish-brown (moist) gravelly loamy fine sand.

D 18 to 36 inches, unweathered gravel and cobblestones; sand content decreases with depth.

The chief variations are in the thickness of the surface soil and the depth to loose sand and gravel. On the very youngest terraces along the West Fork, the dark-colored surface layer is only an inch thick. Where the Clark Fork soils merge with Victor soils, the surface layer may be as much as 5 inches thick. In cultivated fields the dark material is mixed to the depth of the plow layer. Although the depth to gravel is typically about 15 inches, it varies from 10 to 24 inches.

Clark Fork soils are rapidly permeable, but they have a low to very low water-holding capacity. The erosion hazard is negligible. There is some danger of damage from summer frosts, especially in the upper valleys, that is, the valleys of the East Fork and the West Fork.

Clark Fork fine sandy loam, level (C2f).—This soil is on slopes of less than 2 percent. It occurs on smooth terraces and is intermingled with other Clark Fork soils. Irrigation water comes mostly through small local ditches from the Bitterroot River or one of the side creeks. Reliability of delivery varies.

Cleared areas that get enough irrigation water are used chiefly for mixed hay and pasture. Occasionally small grain may be grown. Some farmers near Darby use this soil to grow small fruits such as strawberries and raspberries.

This soil is too droughty to be farmed under dryland management.

Clark Fork fine sandy loam, gently sloping (C2g).—This soil is on slopes of 2 to 5 percent. It occurs on terraces and fans, chiefly in the upper valleys. It is used mostly for mixed hay and pasture. Small grains, if grown, are usually cut for hay. Areas not irrigated are used for pasture or remain in timber.

Clark Fork gravelly fine sandy loam, level (C2h).—This soil is intermediate in characteristics between Clark Fork fine sandy loam and Clark Fork cobbly sandy loam. It is associated with them in the valleys of the East Fork and the West Fork. Most of this soil occurs on low terraces near Darby. Slopes are less than 2 percent. A few gentle slopes are included.

Use and management are the same as for Clark Fork fine sandy loam, level. However, the soil is a little more droughty, and yields are somewhat lower.

Clark Fork cobbly sandy loam, level (C2c).—This soil has more cobblestones, gravel, and coarse sand in the surface soil and subsoil than Clark Fork fine sandy loams. Loose sand and gravel begin at depths of 10 to 20 inches. There are generally enough cobblestones scattered on the surface and through the soil profile to hinder tillage operations. A few garden-sized fields of Clark Fork fine sandy loam are included. A few spots are very cobbly. The soil absorbs water readily but has a very low capacity for holding moisture available for plant growth. Light, frequent irrigation throughout the growing season is necessary, and special management is required to distribute the water evenly. The erosion hazard is negligible. Natural fertility is very low.

This soil occurs chiefly on the broader terraces, such as those west of Connor. Slopes are less than 2 percent. Most of this soil is cutover timber land which is fairly well covered by second growth. Some areas that are still cleared but are not cultivated furnish a little grazing. The few fields that are farmed are used for mixed hay or an occasional crop of small grain.

Clark Fork cobbly sandy loam, gently sloping (C2d).—This is the most extensive soil in the valley of the West Fork and the upper reaches of the valley of the East Fork. Most of the terraces are narrow, and some of them include narrow colluvial slopes along their upland edges. In places, the terraces are broken into several levels. Slopes range from 2 to 5 percent.

Most of the areas are in second-growth timber. Areas that are farmed are used almost entirely for mixed hay or pasture. Average yields are low.

Clark Fork cobbly sandy loam, sloping (C2e).—This soil occupies the steeper parts of the terraces and the broader upland edges on which colluvium from mountain slopes has accumulated. The topography is generally irregular. Slopes range from 5 to 9 percent. This soil contains more cobblestones than the level and gently sloping phases.

Nearly all of this soil is still timbered. The few areas cleared and cultivated are used almost entirely for pasture or mixed hay. Yields are low.

Clark Fork very stony sandy loam, gently sloping and sloping (C2m).—The dominant characteristic of this soil is stoniness. Angular and subangular stones, some of which are 10 feet or more in diameter, are scattered over the surface. In many places the stones are so close together that a person can step or jump from one to another. The soil between the rocks is a sandy loam very much like that described as Clark Fork fine sandy loam. Apparently the fine earth is of the same origin as that in other Clark Fork soils. The stones must have tumbled from nearby mountain slopes.

Some areas are gently sloping, some are sloping, and some are a complex of slopes. The range in slopes is from 2 to 9 percent.

This soil is too stony to cultivate. Most of it remains in timber. Areas that have been cleared by logging operations or fire are used only for native pasture. The forage yield is low. In time the cleared areas will undoubtedly revert to forest.

Clark Fork very stony sandy loam, strongly sloping

(C2n).—Most areas of this soil are along the West Fork and the upper reaches of the East Fork. They are mostly very stony colluvial slopes at the upland edges of low terraces. However, the proportion of stones and the nature of the soil between the stones are the same as in the Clark Fork soils on other parts of the terraces. In most areas, slopes are from 9 to 15 percent. In a few areas slopes are steeper than 15 percent. Most of this soil is covered with timber. Only scant forage is produced.

Clark Fork loam, level (C2k).—This is a brown or yellowish-brown shallow to moderately deep loamy soil. It occurs in scattered small areas on low terraces, most of it in the valley of the East Fork. Slopes are less than 2 percent. This soil is deeper, finer textured, and more productive than the other Clark Fork soils. It has about the same texture as Victor loam, but it has a thinner surface layer and a much browner subsoil. It is rapidly permeable and has low water-holding capacity. Its natural fertility is low.

In places, the depth to loose material is much more than 20 inches. Some areas are somewhat seeped from heavy irrigation and are somewhat mottled in the subsoil.

Cultivated areas are used mostly for mixed hay and pasture. Some small grains are grown.

Clark Fork loam, gently sloping (C2l).—This soil occupies scattered small areas along the East and West Forks of the Bitterroot River. A few areas are on slopes of 5 to 9 percent, but most are on slopes of 2 to 5 percent.

Areas of this soil, if farmed, are used almost entirely for mixed hay and pasture.

Como Series

The Como are light-colored, acid, loose, gravelly soils of the high fans on the west side of the valley. They are droughty and not very productive. Typical areas occur on Charlos Heights, west of Woodside. The parent materials are weathered granitic and gneissic gravel and cobblestones washed from canyons in the Bitterroot Mountains during one of the early periods of glaciation. These soils have developed under a dense coniferous forest. The normal annual precipitation is 14 to 18 inches. Slopes are gentle to steep. Surface drainage is good to excessive, and underdrainage is excessive. Virgin soils have a surface layer consisting of an inch or two of partly decomposed leaf litter, an equal thickness of moderately dark-colored gravelly coarse sandy loam, and 10 to 18 inches of light-colored gravelly coarse sandy loam or loamy sand. The subsoils are gravelly loamy sands in which are embedded soft clods of brown loam. Pebbles and cobblestones throughout the profile are rotten and easily crushed. All horizons are medium to slightly acid.

The Como soils are much coarser textured and have more weakly differentiated horizons than the soils of the Lick series. They have developed in the same kind of materials as the Blodgett soils but are much lighter colored and somewhat more porous. Woodside soils are similar to the Como soils but have a higher proportion of fine sand and are browner in color.

Profile of Como gravelly coarse sandy loam:

A_0 1 to 0 inches, partly decomposed litter of needles and leaves.

A_1 0 to 2 inches, grayish-brown (dry) to very dark grayish-brown (moist) very friable light coarse sandy loam; weak crumb structure; medium acid.

A_2 2 to 12 inches, very pale brown (dry) to light brownish-gray (moist) very friable light gravelly coarse sandy loam or loamy sand; medium acid.

B_2 12 to 25 inches, light gravelly coarse sandy loam or loamy sand the same color as the A_2 horizon above; scattered weakly cemented brown (dry) to dark-brown (moist) subangular blocks; medium acid.

C 25 to 36 inches, loose granitic coarse sand, gravel, and cobblestones; strongly weathered—many of the particles are rotten enough to crush by hand.

In places, the A horizons are gravelly loamy coarse sand and may be somewhat cobbly. In some places, there is practically no subsoil development; in others, the subsoil is a continuous band of brown (dry) to dark-brown (moist) weakly subangular gravelly coarse sandy loam.

The Como soils are very permeable to moisture, roots, and air. The erosion hazard is not great, even on steep slopes, because of the coarse textures. The soils are droughty and of very low natural fertility. They absorb water very rapidly but have a very low capacity for holding moisture available for plants. Light frequent irrigation throughout the growing season and liberal use of barnyard or green manure are required for best results. The soils respond to applications of nitrogen and phosphate, but generally not enough to make it profitable to use them.

Como gravelly coarse sandy loam, gently sloping (C2o).—This soil occurs on smooth remnants of the original surfaces of high fans on the west side of the valley. Most slopes are between 2 and 5 percent, but a few small areas of less than 2-percent slopes are included.

Most of this soil has been cleared and farmed. Much of it was once in apple orchards. It is now used for mixed hay and pasture. Some small grain is grown in rotation with hay or pasture. Areas that have very little water or none are used for pasture or are abandoned. Some areas are covered with second-growth timber.

Como gravelly coarse sandy loam, sloping (C2p).—This soil occurs in the same kind of topographic positions as Como gravelly coarse sandy loam, gently sloping, and also on areas that slope toward local drains. Slopes range from 5 to 9 percent. The soil is used and managed in about the same way as the gently sloping phase, and yields are about the same.

Como gravelly coarse sandy loam, strongly sloping (C2r).—This soil occurs on the steeper parts of the original fan surfaces and on slopes along local drains. Slopes range from 9 to 15 percent.

Where cleared and developed, this soil is used chiefly for pasture and mixed hay. It is rarely used for cultivated crops. Much of it is not irrigated and provides only scanty pasture. A large percentage is still covered with timber.

Como gravelly coarse sandy loam, moderately steep

(C2s).—At lower elevations this soil occupies the loose gravelly edges of fans and benches, including a few on the east side. At higher elevations, it occurs on fan slopes as well, and in large bodies. Other soils may be mapped with this soil, especially on bench edges. Slopes range from 15 to 25 percent.

This soil is used for timber and for dryland pasture. Nearly all areas have at least a scattering of trees remaining, and many are densely forested.

Como gravelly coarse sandy loam, steep (C2t).—This soil occurs in the same kind of topographic positions as Como gravelly coarse sandy loam, moderately steep, but on slopes steeper than 25 percent. It is used and managed in about the same way as the moderately steep phase.

Como coarse sandy loam, gently sloping (C2u).—This is a light-colored, acid, coarse sandy soil that occurs on smooth remnants of the original surfaces of high fans and terraces on the west side of the valley. Slopes range from 2 to 5 percent. The parent material was weathered granitic outwash.

This soil is like Como gravelly coarse sandy loam except that it has fewer pebbles and cobblestones in the surface soil. It is permeable to moisture, air, and roots, but it has a low moisture-holding capacity. It is droughty and has very low natural fertility. Its coarse texture and rapid permeability make it resistant to erosion, even on relatively steep slopes. A few small areas of sandy loam and a few areas on slopes of less than 2 percent have been included in the mapping unit.

Nearly all of this soil was cleared and planted to apple trees during the orchard boom at the beginning of the century. It is now used mostly for mixed hay and pasture. Some small grains are grown when the ground is being prepared for reseeding.

Como coarse sandy loam, sloping (C2v).—This soil occurs on the more recently developed slopes along local drainageways and on remnants of the original surfaces of high fans on the west side of the valley. Slopes range from 5 to 9 percent.

Use and management are about the same as for Como coarse sandy loam, gently sloping. Yields are slightly lower.

Como coarse sandy loam, strongly sloping (C2w).—This soil occurs on the upper parts of high fans on the west side, and on slopes along local drains. It is on slopes of 9 to 15 percent.

Irrigated areas are used mostly for mixed hay or pasture and are cultivated only at long intervals. Areas not irrigated are used for pasture and timber.

Como coarse sandy loam, moderately steep (C2x).—This soil occurs on slope breaks along drainageways and on the upper parts of fans where they merge with the mountainsides. Slopes range from 15 to 25 percent. Cleared areas are used for pasture, usually without irrigation. Many areas are still forested.

Como stony coarse sandy loam, gently sloping (C2y).—This is a light-colored, acid soil that has developed under coniferous forest in weathered granitic outwash on high west-side fans. Slopes range from 2 to 5 percent. This soil is loose, rapidly permeable, and droughty. Natural fertility is very low. It is like Como gravelly coarse sandy loam except that enough large and small stones are scattered over the surface and through the soil to interfere with cultivation.

Cleared and irrigated areas are used for pasture and mixed hay. Nonirrigated areas are used for pasture or timber. The soil is so stony that it is rarely cultivated.

Como stony coarse sandy loam, sloping (C2z).—This soil occurs on slopes of 5 to 9 percent. It is used and managed in about the same way as Como stony coarse sandy loam, gently sloping.

Como stony coarse sandy loam, strongly sloping (C3a).—This soil occurs on slopes of 9 to 15 percent. Much of it is in timber. Cleared areas are used mostly for nonirrigated pasture.

Como stony coarse sandy loam, moderately steep (C3b).—This soil occurs on slopes of 15 to 25 percent. It is so steep and stony that it is used only for pasture and timber.

Como stony and very stony coarse sandy loams, gently sloping (C3c).—This mapping unit is an undifferentiated group of stony Como soils on slopes of 2 to 5 percent. These soils are loose and droughty and are too stony to cultivate. They are used only for timber and pasture.

Como stony and very stony coarse sandy loams, sloping (C3d).—This soil occurs on slopes of 5 to 9 percent. It is used only for timber and for range.

Como stony and very stony coarse sandy loams, strongly sloping (C3e).—This soil occurs on slopes of 9 to 15 percent. It is used only for timber and for range.

Como stony and very stony coarse sandy loams, moderately steep (C3f).—This soil occurs on slopes of 15 to 25 percent. It is used only for timber and range.

Como stony and very stony coarse sandy loams, steep (C3g).—This soil occurs on slopes steeper than 25 percent. It is used only for timber and range.

Cooney Series

The Cooney series consists of well-drained loamy soils that are moderately deep over hard sandstones and quartzites. These soils occur on the east side, on sloping to hilly terrain above the valley. They have developed in loamy materials, part of which weathered from the underlying bedrock and part of which was deposited by wind from other areas. The climax vegetation was grass, chiefly the bluebunch-wheatgrass association. The normal annual precipitation is 13 to 16 inches, and the growing season is long enough to allow small grains to mature.

The Cooney soils have moderately thick, very dark grayish-brown surface soils and moderately thick, moderately permeable, dark grayish-brown to grayish-brown loam subsoils. The substratum is light brownish-gray, strongly calcareous, friable loam, underlain at 20 to 36 inches by partly weathered or hard, usually fractured sandstone and quartzite. There may be a scattering of sandstone or quartzite fragments, especially in the subsoil. All horizons have a high percentage of silt and very fine sand. The soils are moderately permeable and have moderately high mois-

ture-supplying capacity. Natural fertility is high.

The Cooney soils are better developed than the Castner soils, deeper over bedrock, and less stony; they are shallower over bedrock than soils of the Gird series. They differ from soils of the Maiden series in being over sandstones or quartzites rather than limestones. They are much more silty and less strongly developed than the Duffy and Brownlee soils, which have developed over granite. They do not have the columnar claypan subsoils of the Haccke series.

Profile of Cooney loam:

A_1 0 to 5 inches, grayish-brown (dry) to very dark grayish-brown (moist) friable loam; weak thick platy structure that breaks to moderate medium crumb structure; neutral reaction; clear transition to next horizon.

B_2 5 to 12 inches, light brownish-gray (dry) to dark grayish-brown (moist) friable heavy loam; weak medium blocky structure; abcut neutral reaction; gradual transition to next horizon.

B_3 12 to 18 inches, pale-brown (dry) to grayish-brown (moist) friable loam; very weak medium blocky structure; slightly alkaline; abrupt transition to next horizon.

C_{ca} 18 to 28 inches, light-gray (dry) to light brownish-gray (moist) friable massive loam; contains weathered sandstone fragments; strongly calcareous; gradual transition to next horizon.

D 28 inches +, fractured, weakly weathered, hard sandstone.

The degree of weathering in the substratum varies. In some areas hard rock begins abruptly and there is no weathered transition horizon. In these areas, the parent material probably consists mostly of wind deposits.

Cooney loam, sloping (C3h).—This soil occurs on convex and plane slopes of 5 to 9 percent, usually in small areas. The areas that are large enough can be tilled but they are likely to erode when fallow.

The principal use is grazing. Some areas are in native range. Others have been seeded to crested wheatgrass, intermediate wheatgrass, and alfalfa. Hay may be cut from these fields in good years. Some areas are used for small grain under an alternate crop-fallow system. The one or two small irrigated areas are used and managed in the same way as Bitterroot silt loam, sloping.

Cooney loam, strongly sloping (C3k).—This soil occurs on convex and plane slopes of 9 to 15 percent. Most of the areas are small. They are too steep to be suitable for cultivation. The erosion hazard is high in fallow fields.

The chief use is grazing. Most areas formerly plowed have been reseeded to pasture. The few areas still cultivated are used for small grains under a crop-and-fallow system.

Cooney loam, moderately steep (C3l).—This soil occurs chiefly on plane slopes of 15 to 25 percent, along drainageways. It is associated with the shallow stony Castner soils. It is too steep for cultivation. It remains in native range and is used for grazing.

Cooney-Haccke Complex

This complex occurs on sloping to hilly benches and uplands on the east side of the valley. It consists predominantly of permeable, moderately deep Cooney silt loam. Between 10 and 15 percent of the complex is Haccke silt loam, which has a claypan in the subsoil. The Haccke soil occurs in spots that are of irregular shape and varying size but are mostly less than 100 feet long. Locally, these are called "slick spots" or "scab spots." Intergrades between the Haccke and Cooney soils make up 20 to 30 percent of the complex.

A detailed description of the Cooney soil is given under the Cooney series, and of the Haccke soil, under the Amsterdam-Haccke complex.

Cooney-Haccke silt loams, sloping (C3m).—This mapping unit occurs on convex to concave benches cut in the bedrock and on uplands. Slopes are 5 to 9 percent. The areas can be tilled, but they erode when fallow.

Part of this unit is used for grazing and part for the dryland production of small grains under an alternate crop-fallow system. On well-managed native ranges the spots of Haccke silt loam have not been a problem, but on overgrazed ranges these spots deteriorate more rapidly than the Cooney silt loam and are difficult to restore to productivity. Fields that have been cultivated and then reseeded to perennial grasses generally have spotty stands of uneven growth. The slick spots are hard to cultivate when too wet or too dry. Good stands are difficult to establish, and yields are small except in the most favorable years.

Cooney-Haccke silt loams, strongly sloping (C3n).—This mapping unit occurs on convex to plane uplands of 9 to 15 percent slopes. Cultivation is possible but is not advisable because the slopes are so steep and so likely to erode when fallow.

Use and management are the same as for Cooney-Haccke silt loams, sloping, except that less of this unit has been cultivated.

Cooney-Haccke silt loams, moderately steep (C3o).—This mapping unit occurs chiefly on smooth coulee slopes of 15 to 25 percent. It is associated with Castner soils and other shallow stony soils. It is too steep for cultivation and has been used almost entirely for grazing. It produces well if conservatively used, but it deteriorates rapidly if overgrazed.

Corvallis Series

The Corvallis are silty, alluvial soils that occur on the low fans of the systems of fans and flood plains where the major east-side creeks enter the main valley. The parent material is weakly stratified silty fine earth washed, during geologically recent times, from uplands and benches on the east side. The soils developed under grass. The normal annual precipitation is 12 to 14 inches.

Corvallis soils have uniformly loamy profiles and little horizon differentiation except in color. Such texture differences as exist are the result of stratification in the parent material. Although normally calcareous throughout, the soils have no horizons of lime accumulation. The moderately thick, moderately dark colored surface soils grade to light yellowish-brown, more or less mottled, or light-gray weakly stratified silt loam and loam at depths of 12 to 20

inches. The underlying material, beginning at depths of 3 to 5 feet, consists of sand and gravel.

These soils are deep to very deep. They are moderately permeable and have high moisture-holding capacity. Drainage is somewhat restricted because the water table is high during at least part of the year. Runoff from higher areas adds moisture. Being nearly level, these soils are not likely to erode. Natural fertility is very high. Some areas of Corvallis soils benefit from subirrigation; other areas are so poorly drained that they are unsuitable for crops. Some areas are slightly to moderately saline.

Corvallis soils are the imperfectly drained alluvial members of the group of soils developed in silty loess-like materials. They differ from the Hamilton soils chiefly in being less well drained, from the Gallatin soils in being lighter colored and usually better drained, and from the Slocum soils in having developed in silty materials on low fans rather than in loam to sandy loam materials on flood plains.

Profile of Corvallis silt loam:

A_1 0 to 8 inches, grayish-brown (dry) to very dark gray (moist) friable silt loam; weak fine platy structure; weakly calcareous.

AC 8 to 12 inches, grayish-brown (dry) to dark grayish-brown (moist) friable silt loam; very weak fine subangular blocky structure; calcareous.

C_1 12 to 23 inches, light brownish-gray (dry) to grayish-brown (moist) friable silt loam; massive structure; strongly calcareous.

C_2 23 to 36 inches, light brownish-gray (dry) to grayish-brown (moist), faintly mottled, friable loam; massive structure; calcareous.

C_3 36 to 48 inches, stratified loam and fine sandy loam of the same color as the C_2 horizon; weakly calcareous.

D 48 to 54 inches, sand and gravel.

Some profiles are uniformly silty. Others are weakly stratified and may contain strata of noncalcareous fine sandy loam. Mottling in the subsoil varies from distinct to absent. The depth to sand and gravel ranges from 36 to more than 60 inches.

Corvallis silt loam (C3p).—This soil occurs chiefly on the east side of the main valley, on the lower parts of low fans. Slopes are less than 2 percent. After the irrigation season starts, the water table normally rises enough to subirrigate the soil. However, the soil is generally dry enough in the spring so that it warms up readily and can be cultivated easily.

All of this soil is irrigated. It is used for all crops common to the valley except peas, fruits, and other crops requiring well-drained soils. Alfalfa stands are generally short-lived. Many areas are used mostly for sugar beets. Irrigation is rarely needed. This is one of the more productive soils in the valley.

Corvallis silt loam, poorly drained variant (C3r).—This soil occurs on the east side of the valley, in sags on low fans and flood plains. It is too poorly drained to be cultivated unless it is artificially drained. The water table is high most of the time. Slopes are less than 2 percent.

This soil is used almost entirely for pasture. It has a relatively high carrying capacity. From time to time, attempts have been made to cultivate some areas, but without success except where the soil is artificially drained. If drained, the soil could be used for the same crops as Corvallis silt loam.

Corvallis silt loam, slightly saline (C3s).—This soil occurs on the lower parts of low fans on the east side of the main valley and in the valleys of Willow Creek and other major side streams. It is slightly saline and in a few spots moderately saline. The salts are mostly sodium salts; nevertheless, the soil could probably be reclaimed by drainage and leaching. After the irrigation season begins most areas are subirrigated, but if the soil were reclaimed surface irrigation would be necessary.

This soil is used for both native pasture and cultivated crops. Cultivated crops are generally limited to sugar beets, small grains, and legume or mixed hay. Sometimes seeds do not germinate readily, but after good stands have been established yields are about as good as on Corvallis silt loam.

Corvallis silt loam, moderately saline (C3t).—This soil is associated with Corvallis silt loam, slightly saline. It occurs on the lower parts of low fans on the east side of the main valleys and in the valleys of the major side streams. It is moderately saline, and some spots are strongly saline. The reaction is generally strongly alkaline (pH greater than 8.5). Drainage is somewhat poor. Some areas less than 36 inches deep over gravel are included.

Because they are located among better soils, many areas of this soil are farmed but without much success. It is difficult to get satisfactory stands, and yields are poor even when stands are established. Complete drainage and thorough leaching would be required to reclaim these soils. Areas that remain in grass have a moderately high carrying capacity.

Corvallis silt loam, cobbly subsoil (C3u).—This soil occurs chiefly on fans along Burnt Fork Creek, east of Stevensville. It is slightly saline and somewhat more poorly drained than is typical of the series. The restricted drainage is caused by underflow from Burnt Fork Creek rather than by seepage from irrigation of higher areas. The overflow occurs early enough in the season to interfere with spring cultivation. Scattered to numerous cobblestones are embedded in the silts of the subsoil. With good artificial drainage, this soil should have the same characteristics and use suitabilities as Corvallis silt loam.

This soil is not intensively cultivated. It is used chiefly for mixed hay and pasture. Small grains are the most common cultivated crops.

Corvallis silt loam, moderately shallow, slightly saline (C3v).—This soil has the same distribution as Corvallis silt loam, slightly saline. It differs only in being shallower over sand and gravel, which occur at depths of 20 to 36 inches. If artificially drained, it would not be quite as productive as Corvallis silt loam, slightly saline. However, it is used in about the same way.

Dominic Series

The Dominic are shallow, gravelly and cobbly, loose sandy soils. They occur on low fans and terraces on the east side of the valley. The parent materials are

mostly rounded cobblestones and gravel of quartzite and argillite, mixed with some sandy fine earth in the upper 12 to 20 inches. The soils have developed under dry grasslands, in a region normally receiving 12 to 14 inches of precipitation annually. Slopes range from 0 to 5 percent, and the topography is smooth to microundulating. The largest and most nearly typical areas are on the fans of Burnt Fork Creek, southeast of Stevensville.

The Dominic soils are characterized by very dark grayish-brown, coarse, porous surface soils and dark grayish-brown cobbly or gravelly sandy loam subsoils. They are underlain by loose cobblestones, gravel, and coarse sand within 12 to 20 inches. They have low moisture-holding capacity, very rapid permeability, excessive drainage, and low natural fertility.

The Dominic soils have lighter colored surface layers and thinner, more porous subsoils than the Lolo soils. Most of them have rounder cobblestones and much larger quantities of them. They differ from the Grantsdale soils in not having surface horizons developed chiefly in loamy fine earth and in having practically no free lime carbonate. They developed in materials that were coarser and were derived from different kinds of rock than the granitic materials in which the Lone Rock soils developed.

Profile of Dominic very cobbly sandy loam:

A_1 0 to 6 inches, grayish-brown (dry) to very dark grayish-brown (moist) very friable very cobbly sandy loam; weak medium crumb structure; neutral to slightly alkaline; clear transition to AC horizon.

AC 6 to 10 inches, light brownish-gray to dark grayish-brown very cobbly very friable light sandy loam; neutral to slightly alkaline; gradual transition to C_1 horizon.

C_1 10 to 16 inches, pale-brown (dry) to brown (moist) very gravelly or cobbly loose loamy sand; noncalcareous; gradual transition to C_2 horizon.

C_2 16 to 30 inches, pale-brown (dry) to brown (moist) loose sand, gravel, and cobbles; noncalcareous except for a thin lime carbonate undercoating on an occasional cobblestone.

Dominic very cobbly sandy loam, level (De).—This soil occurs chiefly as rather large areas on the fans of Burnt Fork Creek. Scattered small areas are intermingled with Grantsdale soils on other east-side fans. Slopes are less than 2 percent.

This soil is used chiefly for pasture and mixed hays. From time to time some of it has been cultivated but without much success. Frequent irrigation with an extremely large head is necessary.

Dominic very cobbly sandy loam, gently sloping (Df).—Except that it is on slopes of 2 to 5 percent, this soil is like Dominic very cobbly sandy loam, level. Use and management are about the same for both phases.

Dominic cobbly loam, level (Da).—This soil occurs in rather large areas near Stevensville. Slopes are less than 2 percent. It has more fine earth in its surface soil and upper subsoil than other Dominic soils. South of Stevensville the mapping unit includes some deeper and more silty soils which are like Grantsdale loam, shallow, in some characteristics. Parts of the areas north of Stevensville are underlain by Tertiary clays at depths of 4 to 5 feet.

This soil is nearly all irrigated. Most of it was once planted to apple orchards. It is now used chiefly for hay, grain, and pasture. Mixed hay is grown more extensively than alfalfa. Alfalfa stands deteriorate and become grassy rather rapidly. Hay meadows and pastures are left uncultivated as long as possible because cobblestones make tillage difficult.

Dominic cobbly loam, gently sloping (Db).—This soil occurs in the same general areas as Dominic cobbly loam, level, and is the same except for slope. The slope range for most of this soil is from 2 to 5 percent, but a few small areas are on slopes steeper than 5 percent. Use and management are about the same as for the level phase.

Dominic gravelly loamy sand, level (Dc).—This soil occupies low fans and terraces on the east side of the valley. It occurs as "gravel bars" in areas of Grantsdale and Hamilton soils. It is less cobbly than other Dominic soils. The gravel is derived partly from igneous rocks and is fresh and hard. Slopes range from 0 to 2 percent.

Small areas of this soil are farmed with adjoining arable soils, but they are not productive. The larger areas are used for pasture. They produce little forage unless they are irrigated frequently.

Dominic gravelly loamy sand, gently sloping (Dd).—This soil occurs on undulating irregular topography. It is like Dominic gravelly loamy sand, level, except that it is on slopes of 2 to 5 percent. A few ridges and bench edges are steeper. Use and management are the same as for the level phase.

Gallatin Series

The Gallatin are dark-colored, imperfectly to poorly drained alluvial soils that have developed in loamy to clayey deposits. They occur on low terraces or flood plains along perennial streams, principally in the valleys of the east-side creeks and in Sula Basin. These soils have developed under associations of moisture-loving grasses and sedges. The normal annual precipitation varies. Overflow and natural subirrigation have controlled the amount of moisture available for plants. The length of the growing season also varies. In the main valley, it is long enough for sugar beets, but in Sula Basin it is scarcely long enough to mature small grains.

The Gallatin soils are characterized by black, thick surface soils that are high in organic matter, and by dark-gray subsoils and substrata of clay loam to loam texture. They are underlain at depths of 24 to 36 inches or more by sands and gravels. In the wettest spots there may be a surface mat of organic matter 2 to 6 inches thick. The profiles are slightly alkaline and normally calcareous. The soils are moderately deep to deep. Permeability is moderate to moderately slow, and the moisture-supplying capacity is high. Natural fertility is high. Drainage varies from moderately good to somewhat poor.

The Gallatin soils are noticeably darker colored than the Corvallis and Slocum soils and are higher in organic matter. Usually they are more poorly drained. They occur in somewhat different positions than the Larry soils of the west-side low fans, are alkaline and

normally calcareous rather than acid, and are generally somewhat better drained. The drained phases are like soils of the Adel series in many characteristics but are less well drained.

Profile of Gallatin silty clay loam:

A_0	1 to 0 inches, black peat and root mat.
A_p	0 to 6 inches, black firm silty clay loam mixed with chunks of peat; weak coarse granular to massive structure; weakly calcareous.
A_1	6 to 16 inches, black firm silty clay loam; moderate medium and coarse granular structure; calcareous.
AC	16 to 22 inches, very dark gray (dry) to black (moist) friable silt loam; weak medium granular structure; calcareous.
C	22 to 33 inches, grayish-brown (dry) to dark grayish-brown (moist) friable loam, mottled with browns and grays; calcareous.
C_g	33 to 42 inches, gray (dry) to very dark gray (moist) irregularly stratified fine sandy loam to clay loam; calcareous.
D_1	42 to 48 inches, loamy sand; grades to D_2 horizon.
D_2	48 to 56 inches, loose sand and gravel.

Gallatin silty clay loam, level (Gf).—This soil occurs on flood plains and low fans along the side creeks from Sula Basin to Stevensville. Most of it is more than 36 inches deep over gravel. Slopes are less than 2 percent. Drainage ranges from somewhat poor to moderately good. Some spots are poorly drained.

This soil is used chiefly for mixed native hay. Yields are relatively high. The few areas that have been plowed have been allowed to revert to native vegetation.

Gallatin loam, drained, level (Ga).—This soil occurs principally on the flood plains of Skalkaho, Willow, and Burnt Fork Creeks. Natural drainage is better than is typical of the Gallatin series. Artificial drainage has been used where necessary, so that all areas are suitable for cultivation. The profile is coarser textured than is typical of the series and it lacks the organic mat at the surface. The depth to gravel varies from 24 to 48 inches.

Much of this soil is cultivated. It is used for all crops commonly grown in the valley except tree fruits. Yields are relatively high. Drainage may be a problem in some fields.

Gallatin loam, drained, gently sloping (Gb).—This soil occurs in the same general locations as Gallatin loam, drained, level, but on slopes of 2 to 5 percent. Most areas are upstream, where the gradient of the valley is steeper, and some are on local fans. Nearly all of this soil is cultivated. A wide variety of crops is grown. Yields are relatively high.

Gallatin loam-gravelly loam, level (Gc).—This complex occurs mostly on slopes of less than 2 percent; a few small areas are on steeper slopes. The dominant soil is Gallatin loam, which is a moderately deep to deep soil typical of the Gallatin series. Scattered through it, as ridges and stringers, are areas of dark gravelly loam, most of which are underlain by gravel at less than 20 inches. Most areas have ridged irregular microrelief that makes irrigation difficult. However, flooding is seldom necessary because of subirrigation. The areas are somewhat poorly to moderately well drained.

This soil is used chiefly for hay and pasture. Some areas are cultivated to small grains. Alfalfa or grass-legume mixtures are used in seeding new meadows, but after a time the stands become chiefly native grass and sedges.

Gallatin silt loam, level (Gd).—This soil occurs on flood plains and low fans along side creeks from Sula Basin to Stevensville. The profile tends to be loamy throughout and lacks the finer textured horizons typical of the series. In most places, this soil is more than 36 inches deep over gravel. Drainage is somewhat poor to moderately good. This soil is used mostly for mixed hay, both native and seeded. Some areas have been cultivated, but regular cropping is uncommon. Yields of mixed hay are relatively high.

Gallatin silt loam, gently sloping (Ge).—This soil occurs mostly on slopes of 2 to 5 percent but a few scattered areas are on slopes steeper than 5 percent. Except for slope, it is the same as Gallatin silt loam, level. Use and management are similar.

Gallatin-Shallow Muck Complex

The Gallatin soils in this complex are a complex of all the soils described under the Gallatin series.

Gallatin-shallow muck complex, level (Gh).—This complex occurs along stream courses. In many side valleys, it occupies the entire valley floor and includes small sloping fans of Breece and Adel soils. The muck and peat occur in sags where drainage is poor. It consists of 6 to 24 inches of muck or moderately well decomposed peat, which overlies mineral soil similar to the Gallatin soils. Coarse grasses, sedges, and rushes are the dominant vegetation. The stream channels and wet, brushy, drainage swales are included in the map areas. Depth to gravel is usually 20 to 42 inches, but a few gravel ridges occur, and some spots may be much more than 42 inches deep. Drainage is mostly somewhat poor, but some stringers or spots are better drained or more poorly drained. A few spots are droughty.

This complex is used for native mixed hay and pasture. The hay meadows are irrigated, constant flooding being the usual practice. Yields of hay are relatively high, but from 20 to 40 percent of the land is too wet, too rough, or too isolated to be mowed. The uncut hay is used for pasture in the fall or early in spring.

Gallatin-shallow muck complex, gently sloping (Gk).—This soil is mostly on slopes of 2 to 5 percent, but a few slopes steeper than 5 percent are included. Except for slope, this mapping unit is like Gallatin-shallow muck complex, level. Use and management are the same.

Gird Series

The Gird soils are mellow, deep, silty, and well drained. They occur on the high bedrock benches and foot slopes of the Sapphire Mountains, most of them at elevations above 4,200 feet. They are underlain by quartzites and sandstones. They occupy gentle to steep slopes. Their parent material is moderately calcareous silty fine earth—partly derived from the

underlying bedrock and partly wind-transported from other areas. The soils have developed under grassland vegetation. The normal annual precipitation was probably 14 to 16 inches. The growing season is long enough to mature small grains.

The Gird soils are characterized by moderately thick, very dark grayish-brown surface soils; thick, friable, brown to pale-brown silt loam subsoils; and moderately calcareous silty substrata, above partly weathered or hard sandstones and quartzites which lie at depths below 4 feet. These soils are moderately permeable and well drained and have good moisture-supplying capacity. Natural fertility is high. The soils are free of stones and gravel.

The Gird soils have darker surface layers than the Amsterdam soils, and the lime carbonate horizons are lower in the profile. Their substrata are hard pre-Cambrian rocks rather than Tertiary sediments. They differ from the Cooney soils chiefly in having a much greater thickness of silty material overlying the bedrock. The substrata are much less calcareous than those of the Gird soils, high lime subsoil variant. The deep substrata of the Sula soils are weathered granitic outwash rather than sandstone or quartzite, and the Gird soils have more calcareous substrata. The Gird soils have much more permeable and friable subsoils than the associated Haccke soils, which are characterized by claypans.

Profile of Gird silt loam:

A_1 0 to 9 inches, dark grayish-brown (dry) to very dark grayish-brown (moist) friable silt loam; moderate fine crumb structure; neutral reaction; clear transition to B_{21} horizon.

B_{21} 9 to 14 inches, brown (dry) to very dark brown (moist) soft friable silt loam; weak coarse blocky structure; neutral reaction; gradual transition to B_{22} horizon.

B_{22} 14 to 27 inches, pale-brown (dry) to brown (moist) soft friable silt loam; weak coarse subangular blocky structure; neutral reaction; gradual transition to B_3 horizon.

B_3 27 to 40 inches, pale-brown (dry) to yellowish-brown (moist) soft friable silt loam; massive structure; mildly alkaline; noncalcareous; abrupt transition to C_{ca} horizon.

C_{ca} 40 to 54 inches, yellowish-brown (dry) to brown (moist) friable silt loam; massive structure; calcareous; diffuse transition to C horizon.

C 54 to 66 inches, dark yellowish-brown (dry) to dark-brown (moist) soft friable loam; massive structure; moderately calcareous; gradual transition to D horizon.

D 66 to 76 inches, partly weathered pre-Cambrian sandstone, which becomes harder and less weathered with depth.

Depths to free lime carbonate and to bedrock vary. Lime carbonate may begin at depths of from 24 to 48 inches, and bedrock may be at 36 to 72 or more inches. The color of the surface soil varies somewhat with elevation.

Gird silt loam, sloping (Go).—This soil occupies smooth and rounded ridges and remnants of foot slopes. Slopes range from 5 to 9 percent. Fields of sufficient size can be used for dryland cultivation. Because the soil profile is uniformly silty, the erosion hazard is rather high when these sloping fields are left fallow.

None of this mapping unit is irrigated. Much of it has been plowed at some time and used for small grains, chiefly wheat. Some of it has returned to native grass or been seeded to crested wheatgrass and other pasture grasses. Some is used for grazing and some is cultivated. The usual management of cultivated land is alternate crop and fallow. Productivity is relatively high.

Gird silt loam, strongly sloping (Gp).—This soil occurs on rounded ridges and smooth slopes. Slopes range from 9 to 15 percent. Because the slopes are steep and the soil profile is uniformly silty, the erosion hazard is high in cultivated fields.

Much of this mapping unit has been plowed at some time. Some of it is still cultivated to small grains, chiefly wheat, under an alternate crop and fallow system. Productivity is relatively high. Uncultivated areas are in native range or have been seeded to perennial grasses and legumes for grazing. Hay is sometimes cut from the seeded fields.

Gird silt loam, moderately steep (Gr).—This mapping unit occurs mostly on north-facing slopes of 15 to 25 percent, where snow accumulates and remains late in the spring. The surface soils are somewhat darker colored and thicker than those typical of the series. Slopes are too steep for satisfactory cultivation. Nearly all areas remain in native vegetation and are used for grazing.

Gird silt loam, steep (Gs).—This mapping unit is just like Gird silt loam, moderately steep, except that the slopes are steeper than 25 percent. All areas are in native grass and are used for grazing.

Gird Series, High Lime Subsoil Variant

The high lime subsoil variants of the Gird series are mellow, deep, silty, well-drained soils. They occur on the smoother parts of the east-side uplands. They are underlain by dolomitic limestones. Their parent material is highly calcareous, silty fine earth, partly derived from the underlying bedrock and partly wind-transported from other areas. The soils have developed under grassland vegetation. The normal annual precipitation is 14 to 16 inches. Although short, the growing season is long enough so that small grains will mature.

These soils are characterized by moderately thick, very dark grayish-brown surface soils; moderately thick to thick, friable, brown to pale-brown, silty loam subsoils; highly calcareous silty substrata; and weathered limestone at depths below 36 inches. They are deep, moderately permeable, and well drained. They have high moisture-supplying capacity and high natural fertility. There are no stones or gravel on the surface nor in the profile.

The lime horizons are much more highly calcareous than those of the Gird soils and they lie closer to the surface; also, the bedrock is limestone rather than sandstone. These soils are not so dark colored as the Skaggs soils and have developed in silts rather than chiefly in limestone.

Profile of Gird silt loam, high lime subsoil variant:

A_p 0 to 7 inches, dark grayish-brown (dry) to very dark grayish-brown (moist) friable silt loam; moderate very fine crumb structure; neutral reaction; clear transition to B_{21} horizon.

B_{21} 7 to 12 inches, brown (dry) to dark grayish-brown (moist) friable silt loam; weak medium blocky structure; slightly acid; clear transition to B_{22} horizon.

B_{22} 12 to 21 inches, light yellowish-brown (dry) to brown (moist) friable silt loam; moderate medium subangular blocky structure; mildly alkaline; abrupt transition to C_1 horizon.

C_1 21 to 32 inches, very pale brown (dry) to pale brown (moist) friable loam; highly calcareous, contains white streaks and spots of lime carbonate; moderately alkaline; gradual transition to C_2 horizon.

C_2 32 to 45 inches, very pale brown (dry) to pale brown (moist) friable loam; highly calcareous; diffuse transition to C_3 horizon.

C_3 45 to 54 inches, weathered limestone of very fine sandy loam texture.

The thickness of the silts in which these soils developed ranges from about 30 to more than 72 inches. The color of the surface soils varies somewhat with elevation and direction of slope. The depth to free lime ranges from about 15 to 30 inches.

Gird silt loam, high lime subsoil variant, gently sloping (Gt).—This soil occupies slopes of 2 to 5 percent on gently rounded ridges and rock benches. It can be tilled. Most areas are large enough to be farmed or are associated with tillable soils in areas large enough to be farmed.

None of this mapping unit is irrigated. It is used mostly for small grain, chiefly wheat, under an alternate crop and fallow system. Productivity is relatively high. Areas not cultivated are used for range. Hay is sometimes cut from areas that have been seeded to tame grasses.

Gird silt loam, high lime subsoil variant, sloping (Gu).—This soil occupies slopes of 5 to 9 percent on rounded ridges and smooth rock benches. It is suitable for dryland cultivation. The uniformly silty profile and the steep slopes cause some danger of erosion in fallow fields. This soil has been used and managed in the same way as the gently sloping phase.

Gird silt loam, high lime subsoil variant, strongly sloping (Gv).—This soil occurs on sharply rounded ridges and slopes. Slopes are from 9 to 15 percent. The profile is somewhat thinner than those typical of the series. Some cultivated fields are noticeably eroded. Much of this soil has been plowed and used for small grain under an alternate crop-fallow system. Some is still cultivated. Some has been seeded to grasses and legumes and is used for hay or for grazing. Areas still in native sod are grazed.

Gird silt loam, high lime subsoil variant, moderately steep (Gw).—This soil occurs chiefly on north-facing slopes, where snow accumulates and remains late in the spring. Slopes are from 15 to 25 percent. The surface soils are somewhat darker colored and thicker than those typical of the series. The areas are too steep to be cultivated. Nearly all of this mapping unit remains in native sod and is used for grazing.

Gird silt loam, high lime subsoil variant, steep (Gx).—This soil is identical with the moderately steep phase, except that the slopes are steeper than 25 percent. All of this mapping unit is in native sod and is used for grazing.

Gird Series, Sandy Subsoil Variant

The sandy subsoil variants of the Gird series have developed in fine sandy loam to loamy fine sand loess blown over uplands underlain by weathered granite. They occur only on gentle to steep slopes in Sula Basin. The soils have developed under grassland vegetation. The normal annual precipitation is 16 to 18 inches. In some years the growing season is so short that small grains do not mature.

These soils are deep and stone-free. They are characterized by moderately thick, very dark grayish-brown surface soils; thick, very friable, brown to pale-brown fine sandy loam subsoils; and very friable, weakly calcareous loamy fine sand substrata above weathered granite that begins at 36 to 72 inches. Drainage is good, permeability is moderately rapid, and the moisture-supplying capacity is moderately high. Natural fertility is high. The profile differs from that of Gird silt loam only in texture and consistence.

Gird fine sandy loam, sandy subsoil variant, gently sloping (Gl).—This soil occurs on convex ridges, on slopes of 2 to 5 percent. It would be suitable for cultivation except that crops are likely to be damaged by frost.

Although some areas have in the past been plowed and cultivated, all of this mapping unit is now used for grazing. It is too high to be irrigated.

Gird fine sandy loam, sandy subsoil variant, strongly sloping (Gm).—This soil occurs on straight to concave slopes below areas of the steep phase. It would be suitable for limited cultivation except for the frost hazard. Good hay crops could be produced if the soil were irrigated, but the areas lie too high to be irrigated except by pumping. Consequently, this soil is used only for grazing.

Gird fine sandy loam, sandy subsoil variant, moderately steep and steep (Gn).—This soil occurs on upland slopes steeper than 15 percent. It has a somewhat thinner profile than is typical of the series. It is too steep to be cultivated and is used only for grazing.

Gird-Haccke Complex

This complex is mostly Gird silt loam but includes spots of Haccke silt loam intermingled with the Gird soil. It occurs on the uplands below the Sapphire Mountains on the east side of the valley. The Gird soils are deep and permeable. Their capacity to hold moisture available to plants is high, and they are high in natural fertility. The Haccke are claypan soils developed in silty loess. Locally they are called "slick spots" or "scab spots." They occupy 10 to 15 percent of the complex. Another 20 to 30 percent is occupied by soils having characteristics that grade between those of the Haccke and those of the Gird soils.

The Gird soil is like that described under the Gird

series. The Haccke soils have thin to moderately thick dark grayish-brown to very dark grayish-brown surface soils, silty clay loam or silty clay columnar subsoils, and calcareous silt loam substrata. The transition between the surface soils and subsoils is abrupt. Bedrock lies at 36 to 72 or more inches. The subsoils are slowly permeable, but underdrainage is good. The moisture-supplying capacity is high; the natural fertility is moderately high.

Profile of Haccke silt loam:

A_1 0 to 6 inches, dark grayish-brown (dry) to very dark grayish-brown (moist) friable silt loam; distinctly gray in the lower inch; moderate thin platy structure; slightly acid; abrupt transition to B_{21} horizon.

B_{21} 6 to 10 inches, yellowish-brown (dry) to dark-brown (moist) firm silty clay loam; strong coarse columnar structure that has very dark brown surface coatings; neutral reaction; clear transition to B_{22} horizon.

B_{22} 10 to 14 inches, yellowish-brown (dry) to dark-brown (moist) firm silty clay loam; strong coarse blocky structure; moderately alkaline; abrupt transition to C_{ca1} horizon.

C_{ca1} 14 to 20 inches, brownish-yellow (dry) to yellowish-brown (moist) friable silt loam; weak subangular blocky structure; calcareous; moderately alkaline; gradual transition to C_{ca2} horizon.

C_{ca2} 20 to 30 inches, yellow (dry) to brownish-yellow (moist) friable silt loam; calcareous; contains gypsum crystals; mildly alkaline; gradual transition to C_3 horizon.

C_3 30 to 42 inches, yellow (dry) to brownish-yellow (moist) friable silt loam; calcareous; mildly alkaline; gradual transition to C_4 horizon.

C_4 42 to 56 inches, weathered sandstone of loam texture; calcareous; mildly alkaline.

The thickness of the surface soil varies. In places it is only 2 inches thick, and in cultivated fields it may become mixed with the subsoil to make a sticky silty clay loam. Depth to bedrock ranges from 30 to 60 inches or more.

Gird-Haccke silt loams, sloping (Gy).—This mapping unit occurs on rounded ridges and smooth rock benches. Slopes range from 5 to 9 percent. A few areas are eroded. This unit is suitable for cultivation, but the slick spots cause some management problems.

None of this mapping unit is irrigated. Some areas are used for small grains, chiefly wheat, under an alternate crop and fallow system. Yields vary widely from year to year because of the slick spots. It is difficult to establish stands on these spots, and they are more droughty than friable soils. Many areas are in native sod or seeded grasses and are used for grazing or for hay.

Gird-Haccke silt loams, strongly sloping (Gz).—This mapping unit occurs on sharply rounded ridges and smooth upland slopes. Slopes range from 9 to 15 percent. Some areas are noticeably eroded.

Some of this mapping unit is under dryland cultivation. It has the same management problems as Gird-Haccke silt loams, sloping, plus the problem of steeper slope. Other areas are in native sod or have been seeded and are used for grazing.

Gird-Haccke silt loams, moderately steep (G2a).—This mapping unit occurs chiefly on north-facing slopes of 15 to 25 percent gradient. Surface soils are somewhat darker colored than typical. The areas are too steep to cultivate and are used for grazing.

Gird-Haccke silt loams, steep (G2b).—This mapping unit occurs on north-facing slopes of more than 25 percent gradient. Surface soils are somewhat darker colored than typical. The areas are used for grazing.

Gird-Teton-Haccke Complex

This complex occurs high on the east side of the valley, just below the Sapphire Mountains. The normal annual precipitation in this area is 18 inches or more, and the growing season is extremely short. The soils have developed under grass. The parent material is silt over weathered sandstone of the Belt formation. The areas are about 35 percent Gird soils, 25 percent Teton soils, 15 percent Haccke soils, and 25 percent soils intermediate in characteristics between the Haccke and the other two. The Gird and Haccke soils in this complex are darker colored than the typical soils described for the two series. A profile of the Haccke soil is described under the Gird-Haccke complex.

The Gird and Teton soils are well-drained, deep, permeable soils. They have high moisture-holding capacities and high inherent fertility. The Haccke soils are somewhat less fertile and have claypan subsoils that are only slowly permeable.

Gird-Teton-Haccke loams, strongly sloping (G2c).—This mapping unit occurs chiefly on upland ridges where slopes are 9 to 15 percent. A few areas are on slopes of 5 to 9 percent. The growing season is too short for small grains.

When first homesteaded, many of these lands were plowed and cultivated for a while. All have since returned to grass. They are used for grazing.

Gird-Teton-Haccke loams, moderately steep (G2d).—This mapping unit occurs on upland slopes of 15 to 25 percent gradient. It is used only for grazing.

Gird-Teton-Haccke loams, steep (G2e).—This mapping unit occurs on north-facing slopes, where snow accumulates and stays until late in spring. Slopes are steeper than 25 percent. The areas are used only for grazing.

Gorus Series

The Gorus soils are light colored, deep, mellow, and well drained. They have developed under dense coniferous forests in wind-deposited silts. They occur on high benches on the west side near Darby and in Sula Basin. These soils have developed under a normal annual precipitation of more than 18 inches. In most years the growing season is long enough so that small grains will mature.

The Gorus soils have moderately thick, pale-brown, acid surface soils; moderately thick, dark yellowish-brown, acid silt loam subsoils; and light yellowish-brown, noncalcareous silt loam substrata. Beneath the substrata, at depths of 24 to 60 or more inches, is strongly weathered brown granitic outwash of heavy

loam texture. The soils are stone-free. They are moderately permeable and high in moisture-supplying capacity. Natural fertility is low.

The Gorus soils differ from the Sula soils chiefly in having much lighter colored surface layers and browner subsoils. They differ from the Lick soils, which are developed in strongly weathered granitic outwash, in having more silty profiles and less strongly contrasting horizons.

Virgin profile of Gorus silt loam:

A_{00}, A_0 2 to 0 inches, about one-half fresh pine needles and one-half decomposed organic mat; underlain by a dark A_1 mineral horizon less than ½ inch thick.

A_2 0 to 7 inches, white (dry) to pale-brown (moist) friable silt loam; moderate thin platy structure; slightly acid; merges with B_1 horizon.

B_1 7 to 10 inches, brown (dry) to dark-brown (moist) friable silt loam; moderate medium platy structure; slightly acid; clear transition to B_2 horizon.

B_2 10 to 22 inches, brown (dry) to dark-brown (moist) friable heavy silt loam; strong subangular blocky structure; slightly acid; gradual transition to C horizon.

C 22 to 30 inches, pale-yellow (dry) to light yellowish-brown (moist) friable silt loam; neutral reaction; abrupt transition to D horizon.

D 30 to 42 inches, light-brown (dry) to strong-brown (moist) gritty heavy loam; weak coarse blocky structure; neutral reaction.

The depth to weathered granitic outwash ranges from 18 to 100 inches but usually it is between 20 and 42 inches.

Gorus silt loam, gently sloping (G2f).—This soil occurs on straight to convex remnants of old fan-terraces. Slopes are 2 to 5 percent. This soil can be tilled but produces relatively little unless heavily fertilized. Most areas are cleared, irrigated, and cultivated. Mixed-grass hay and pasture are the principal crops. Small grains are grown at long intervals, when the soil is prepared for a new sod crop.

Gorus silt loam, sloping (G2g).—This soil occurs on slopes of 5 to 9 percent on old high benches. Because of the slope gradient and the uniformly silty surface soil, this soil is very likely to erode if irrigated when fallow. Most areas have been cleared and are irrigated and cultivated. Mixed-grass hay and pasture are the principal crops.

Gorus silt loam, strongly sloping (G2h).—This soil occurs on high benches in association with Lick soils and other Gorus soils. Slopes range from 9 to 15 percent. Cleared and cultivated areas produce mixed-grass hay and pasture. Uncleared areas support second-growth timber and are used for grazing.

Gorus silt loam, moderately steep (G2k).—This soil occurs on bench edges, on 15 to 25 percent slopes. It is mostly in second-growth timber and used for grazing. Areas that are cleared are used for pasture. Most of these have been eroded considerably.

Grantsdale Series

The Grantsdale soils developed in calcareous alluvial fine earth, moderately deep over fresh gravel that was derived from mixed rocks. They occur on low fans and terraces along the major creeks on the east side of the valley. The soils developed under grass. The normal annual precipitation is 11 to 13 inches. The growing season is long enough for sugar beets.

The Grantsdale soils are characterized by moderately thick, very dark grayish-brown surface soils; moderately thick, grayish-brown, friable loam subsoils; and light brownish-gray, highly calcareous loam substrata. The substrata are typically underlain by loose gravel at depths of 20 to 36 inches. These soils are moderately deep and well drained. They have moderately high moisture-holding capacity and high natural fertility. The subsoils are moderately permeable, and the substrata are very rapidly permeable.

The Grantsdale soils are not so deep as the associated Hamilton and Corvallis soils. The fine earth from which the Grantsdale developed is more gritty, and the lime horizons in this series are more pronounced. Typically, the Grantsdale are better drained than the Corvallis soils. They differ from the Victor soils of the west side in having lime carbonate horizons and in being underlain by mixed, rather than granitic, gravel.

Profile of Grantsdale loam:

A_p 0 to 10 inches, grayish-brown (dry) to very dark gray (moist) friable loam; strong fine crumb structure; slightly alkaline; clear transition to B_2 horizon.

B_2 10 to 16 inches, pale-brown (dry) to dark grayish-brown (moist) friable loam; weak medium subangular blocky structure; alkaline to weakly calcareous; clear transition to C_{ca} horizon.

C_{ca} 16 to 26 inches, white (dry) to light brownish-gray (moist) friable loam; contains scattered pebbles; highly calcareous; gradual transition to D horizon.

D 26 to 42 inches, calcareous loose sand and gravel of mixed origin.

Typical Grantsdale soils vary chiefly in depth to loose gravel and in amount of gravel contained in the upper part of the profile. In the Grantsdale-Dominic complex, shallow phases of the Grantsdale soils are recognized.

Grantsdale loam, level (G2n).—This unit occurs on broad smooth areas, on slopes of less than 2 percent. It is associated with various phases of Hamilton, Corvallis, Grantsdale, shallow, and Dominic soils.

Most of this soil is irrigated. When managed properly, it is productive (fig. 7). Most areas are parts of intensively cultivated farms. It is suited to all crops common to the valley. Sugar beets, alfalfa and clover hays, small grains, seed peas, and truck crops are grown, and some areas are used for irrigated pasture.

Grantsdale loam, gently sloping (G2o).—This soil is like Grantsdale loam, level, except that it is on slopes of 2 to 5 percent. It occurs in the upper parts of the side-creek valleys, where the general slope is more than 2 percent, or on gentle breaks between one terrace level and another. It takes the same use and management as the level phase, but yields are somewhat lower and irrigation is more difficult.

Grantsdale Series, Imperfectly Drained Variant

The imperfectly drained variants of the Grantsdale soils have developed in alluvial fine earth that is

Figure 7.—Oats harvest on Grantsdale loam, level. Photo by Ernst Peterson.

shallow to moderately deep over loose gravel. They have high water tables and are usually subirrigated during part of the year. They occur on terraces on the east side of the valley, along Burnt Fork, Willow, and Gird Creeks. They are only a few feet above the channels. These soils developed under grassland vegetation. The normal annual precipitation is 11 to 13 inches.

These soils are characterized by moderately thick, very dark gray, friable, normally calcareous surface soils, and moderately thick, grayish-brown, friable, usually calcareous loam subsoils that contain some cobblestones and gravel. The substrata are highly calcareous, light brownish-gray cobbly and gravelly loam, mottled in many places with yellowish brown and strong brown. Loose gravel begins at 15 to 26 inches. The soils are shallow to moderately deep. They are moderately permeable, but the substrata are very rapidly permeable. They have moderately high moisture-supplying capacity and high natural fertility. Drainage is imperfect, partly because of seepage of irrigation water. Irrigation is needed, however, for maximum crop production.

The imperfectly drained variant of the Grantsdale soils differs from the typical Grantsdale soils chiefly in being less well drained and in being somewhat more cobbly. It is much shallower than the Corvallis soils.

Grantsdale cobbly loam, imperfectly drained variant, level (G2l).—This soil occurs on smooth slopes of 0 to 2 percent gradient. It is well adapted to flood irrigation. Most of the areas are large enough to be managed as separate fields. The cobblestones on the surface and through the profile are a nuisance, but they do not prevent cultivation. This soil is used mostly for alfalfa and clover hays, irrigated pastures, small grains, and sugar beets. Yields are generally good. The seasonally high water table somewhat restricts choice of crops. This difficulty could be remedied by drainage, but much more frequent irrigation would then be necessary.

Grantsdale cobbly loam, imperfectly drained variant, slightly saline, level (G2m).—This mapping unit is similar to the level phase, but it is somewhat wetter and is also slightly saline. It is used more for hay and pasture and less for cultivated crops. The salinity could be readily corrected by drainage and leaching.

Grantsdale and Dominic Soils

Areas of Grantsdale and Dominic soils, mostly the cobbly, gravelly, and shallow phases, occur throughout the Hamilton-Grantsdale-Corvallis fan-and-terrace association. Some areas consist entirely of one or the other of the two soils, and some of a mixture of the two.

Profile characteristics for these two soils are described in the separate series descriptions.

Grantsdale loam, shallow, and Dominic sandy loam, level (G2p).—This undifferentiated group of soils is on slopes of less than 2 percent. Some of the areas consist entirely of one soil, and some of the other, and some include both soils. All of this unit is shallow. Permeability is moderate to moderately rapid in the subsoil and very rapid in the substratum. These soils have moderately high moisture-holding and moisture-supplying capacity and moderately high natural fertility. They require light frequent irrigation because they are somewhat droughty. A few spots are gravelly, and most areas have scattered gravel on the surface.

The Grantsdale soil in this mapping unit is less than 20 inches deep over loose gravel. The surface soils are moderately thick, dark grayish-brown loams; the subsoils are moderately thick to thin, grayish-brown, friable loams; and the substrata are highly calcareous, friable gravelly loams. Loose gravel underlies this profile at less than 20 inches.

The Dominic sandy loam is less cobbly than is typical of the series. It differs from Grantsdale loam, shallow, chiefly in having no free lime in the profile. It has a moderately thick, dark grayish-brown or very dark grayish-brown, friable sandy loam surface soil; a grayish-brown, very friable sandy loam subsoil; and a loose gravelly and cobbly substratum beginning at less than 20 inches.

Most areas of this mapping unit are farmed intensively. They are used for alfalfa and clover hays, small grains, sugar beets, and other crops common to the area, and for irrigated pastures. The soils are used and managed in the same way as Grantsdale loam, except that more frequent irrigation is needed. Yields are somewhat lower. Small areas that occur within areas of deeper soils are usually managed in the same way as the deep soils and consequently show up as droughty spots.

Grantsdale loam, shallow, and Dominic sandy loam, gently sloping (G2r).—This mapping unit is like the level phase, except that it is on slopes of from 2 to 5 percent. Most areas are on low ridges or gentle slope breaks between one terrace level and another. Because it is harder to irrigate, this unit is used more for pasture and hay and less for cultivated crops than the level phase.

Grantsdale and Dominic soils, very shallow, strongly sloping (G2u).—This undifferentiated unit is on shallow gravelly bench edges where the slope gradient is 9 to 15 percent. It is associated with other Grantsdale and Dominic soils. It is used chiefly for grazing. Many areas are not irrigated.

Grantsdale-Dominic Complex

Grantsdale-Dominic cobbly loams, level (G2s).—This mapping unit occurs chiefly on the fan-terraces of Skalkaho Creek near Grantsdale. It is an intricate mixture of cobbly loam soils of the two series. Cobblestones and gravel may be scattered or abundant. The Dominic soils are typical of their series, but the Grantsdale soils are more cobbly than is typical. Permeability is moderate to moderately rapid in the subsoil and very rapid in the substratum. These soils have moderately high to low moisture-holding and moisture-supplying capacity and high to moderately high natural fertility. Drainage is good to somewhat excessive. Cobblestones and gravel on the surface interfere with cultivation. Practically all of this unit is cultivated to alfalfa, small grains, small fruits, or truck crops, or is used for irrigated pastures.

Grantsdale-Dominic cobbly loams, gently sloping (G2t).—This mapping unit is like Grantsdale-Dominic cobbly loams, level, except that it is on slopes of 2 to 5 percent. It occurs mostly as irregular spots on the terrace or as gentle breaks between one terrace level and another. Use and management are the same as for the level phase, but irrigation is more difficult and yields are somewhat lower.

Gravel Pits and Dumps

Gravel pits and dumps (G2v).—This unit includes areas that have been excavated to obtain gravel, or have been flooded with gravel because of canal breaks, or have been used as dumping grounds for mining waste. They have very little agricultural value.

Greeley Series

The Greeley soils developed in sandy alluvium on low terraces and fans on the east side of the valley. They developed under grassland vegetation. The normal annual precipitation is 11 to 13 inches, and the growing season is moderately long. The parent materials are of mixed origin but were derived mostly from granite.

The Greeley soils have moderately thick, dark grayish-brown, very friable fine sandy loam surface soils; moderately thick, brown sandy loam subsoils; and normally calcareous substrata of sandy loam or loamy sand that generally become coarser with depth. These soils are deep or moderately deep. They have moderately high moisture-supplying capacity and moderately high natural fertility. Permeability is moderately rapid, and drainage is good.

The Greeley soils are finer textured and deeper than the Lone Rock soils. They are coarser and less calcareous than the Hamilton soils. They have developed in materials of about the same texture as the Breece soils, but they are lighter colored because they occur in drier areas.

Profile of Greeley sandy loam:

A_p 0 to 10 inches, light brownish-gray (dry) to dark grayish-brown (moist) very friable sandy loam; weak coarse crumb structure; neutral reaction; clear transition to B_2 horizon.

B_2 10 to 17 inches, pale-brown (dry) to brown (moist) very friable sandy loam; weak coarse subangular blocky structure; neutral reaction; gradual transition to C_{ca} horizon.

C_{ca} 17 to 33 inches, very pale brown (dry) to light yellowish-brown (moist) very friable gritty sandy loam; faintly calcareous; gradual transition to C horizon.

C 33 to 48 inches, very pale brown (dry) to bright yellowish-brown (moist) loose loamy sand; very faintly calcareous.

In some places, the profiles are sandy loam to considerable depth. In others, especially in those areas that are associated with the Lone Rock soils, coarse sandy loam or loamy sand may begin at a depth of no more than 15 inches. Not all profiles have calcareous substrata.

Greeley sandy loam, level (G2w).—This soil occurs on generally smooth terraces. Slopes are less than 2 percent. Areas that have a good supply of irrigation water are intensively farmed to all crops commonly grown in the valley. Potatoes are the principal crop. Use and management practices are like those for the Hamilton soils, but average yields are lower. Areas that have limited water supplies are used mostly for small grains, hay, and pasture. The few dryland areas are too droughty for cultivation. They are mostly in native range or introduced perennial grasses.

Greeley sandy loam, gently sloping (G2x).—This soil is like Greeley sandy loam, level, except that it is on slopes of 2 to 5 percent and is somewhat coarser textured. Most areas are on broad smooth fans at the edges of the valleys. Use and management are about the same as for Greeley sandy loam, level, except that some precautions against erosion by irrigation water are necessary.

Greeley sandy loam, sloping (G2y).—This soil occurs on local fans and foot slopes along the edges of the east-side system of low fans and terraces. Slopes range from 5 to 9 percent. The topographic position of this soil is more like that of the Breece series than that of other Greeley soils, but the profile is like that of the Greeley soils. Most areas are used for general farming; legume hays and small grains are the principal crops. Because it is porous, this soil requires a large head of water for satisfactory irrigation. Precautions against erosion are necessary. Some areas of this soil are outside the irrigated parts of the valley and are mostly in native range.

Hamilton Series

The Hamilton soils are deep and free of stones. They developed in silty material more than 36 inches thick over gravel. The principal areas are on the east side of the valley, on coalescing level to gently sloping low fans of the major side creeks. Typical areas are between Hamilton and Corvallis and east of Bell Crossing. Corvallis soils, which are less well drained and more apt to be subirrigated, are associated with the Hamilton soils. Grantsdale soils developed where the depth to gravel was less than 36 inches. The Hamilton soils developed under grassland vegetation. The normal annual precipitation is less than 14 inches.

These soils have moderately thick, dark grayish-brown, friable surface soils; moderately thick, grayish-brown, friable silt loam subsoils; and light yellowish-brown, calcareous silt loam substrata that extend below 36 inches and in some places below 60 inches. The deep substrata are porous sands and gravels. These soils are neutral to mildly alkaline. They may be calcareous throughout, but are free from injurious salts or alkali. All horizons are permeable to roots, moisture, and air, and all have high moisture-holding and moisture-supplying capacity.

This series contains some of the better soils in the valley for cultivated crops. Native fertility is high. Drainage is good. The water table is rarely less than 5 feet below the surface at any time of the year.

The soil profile shows only moderate development. A profile of Hamilton silt loam follows:

A_p 0 to 9 inches, grayish-brown (dry) to very dark grayish-brown (moist) friable silt loam; strong medium crumb structure; neutral reaction; clear transition to A_{12} horizon.

A_{12} 9 to 14 inches, light brownish-gray (dry) to dark grayish-brown (moist) friable silt loam; moderate thin platy structure; neutral reaction; gradual transition to B horizon.

B 14 to 22 inches, very pale brown (dry) to pale brown (moist) friable silt loam; weak medium subangular blocky structure; moderately calcareous; gradual transition to C_{ca} horizon.

C_{ca} 22 to 30 inches, very pale brown (dry) to pale brown (moist) friable silt loam; calcareous, shows white streaks and splotches; clear boundary with C_1 horizon.

C_1 30 to 40 inches, weakly stratified silt loam and very fine sandy loam of the same color as the C_{ca} horizon; calcareous.

C_2 40 to 48 inches, loam containing a few pebbles; grades into gravel.

There is little variation in the profile, except in quantity of and depth to free lime. In places the soil is limy throughout; in others free lime does not occur above 30 or 40 inches. However, all areas appear to have enough calcium for plants. Some profiles have more layers of fine and very fine sandy loam than the profile described. Except for narrow irregular sand channels, most areas are relatively uniform, and all parts respond evenly to management.

Hamilton silt loam, level (Hc).—This soil occurs on smooth fan-terraces. Slopes are less than 2 percent. Most of the areas are large enough to be managed as separate fields. Nearly all areas are irrigated. Although the soil material is highly erosive, erosion is not a serious problem because the fields are level. Many fields have been leveled so that few irregularities that might interfere with furrow or flood irrigation are left.

This soil is responsive to management. It is suitable for all crops commonly grown in the valley. Because of its favorable depth and good water-holding capacity, this soil will produce well under a wide range of irrigation practices. Waterlogging is not a problem.

The principal crops are sugar beets, small grains, and alfalfa or red clover hay (fig. 8). Seed peas, green peas, and potatoes are also grown. On the smaller farms, garden produce and raspberries are grown. A few odd areas and small lots near farmsteads are used for pasture. In a good year, well-managed fields may produce 23 tons of sugar beets, 100 bushels or more of barley, 50 bushels of seed peas, or 6 tons of alfalfa hay per acre. In the same year poorly managed fields of the same soil may produce less than half as much.

Hamilton silt loam, gently sloping (Hd).—This phase occurs on fan-terraces, below high bench edges, and along the steeper side creeks. Slopes are generally between 2 and 5 percent; a few are steeper than 5 percent. This soil occurs in fairly large areas and merges with the level phase in many places. It does not need as careful smoothing as the level phase to prepare it for flood or furrow irrigation, but it is more likely to erode. Poorly located ditches may erode rapidly to the depth of the silty material. Careless irrigation before a good plant cover is established may cause loss of surface soil. Otherwise this soil can be used and managed in the same way as the level phase, and it is equally responsive to good management.

Hamilton fine sandy loam, level (Ha).—This soil occurs on smooth fan-terraces. It is much like Hamilton silt loam, level, but besides having a different surface texture, it contains more layers of fine sandy loam in the subsoil and substratum. Slopes are less than 2 percent. There are a few sandy spots and filled channels. This soil is very slightly lower in moisture-supplying capacity and inherent fertility than Hamilton silt loam, level, but it is used and managed in about the same way. It is equally suited to all crops common to the valley. Average yields may be slightly lower.

Hamilton fine sandy loam, gently sloping (Hb).—This soil occurs on fan-terraces. Slopes range from 2 to 5 percent. The soil is used and managed in the same way as Hamilton silt loam, gently sloping, but yields may be slightly lower.

Hamilton-Corvallis Complex

This complex occurs on the intermediate parts of low fans and terraces on the east side of the valley. Hamilton soils predominate, but significant areas of the Corvallis soils occur. Profile characteristics are given in the series descriptions of the two soils as mapped separately.

The soils of this complex are deep, permeable, and well drained to moderately well drained. They have high moisture-supplying capacity and high natural fertility. They are subirrigated in some places.

Hamilton-Corvallis sandy loams, level (He).—This mapping unit occurs on smooth sections of low fans and terraces on the east side of the valley. Slopes are less than 2 percent. The surface layer is gritty loam in most places but it ranges to fine sandy loam. The characteristics of the profile grade between those of the Hamilton and those of the Corvallis series. This mapping unit is as good for agricultural use as Hamilton silt loam, level, and it is used and managed in the same way as that soil (fig. 9).

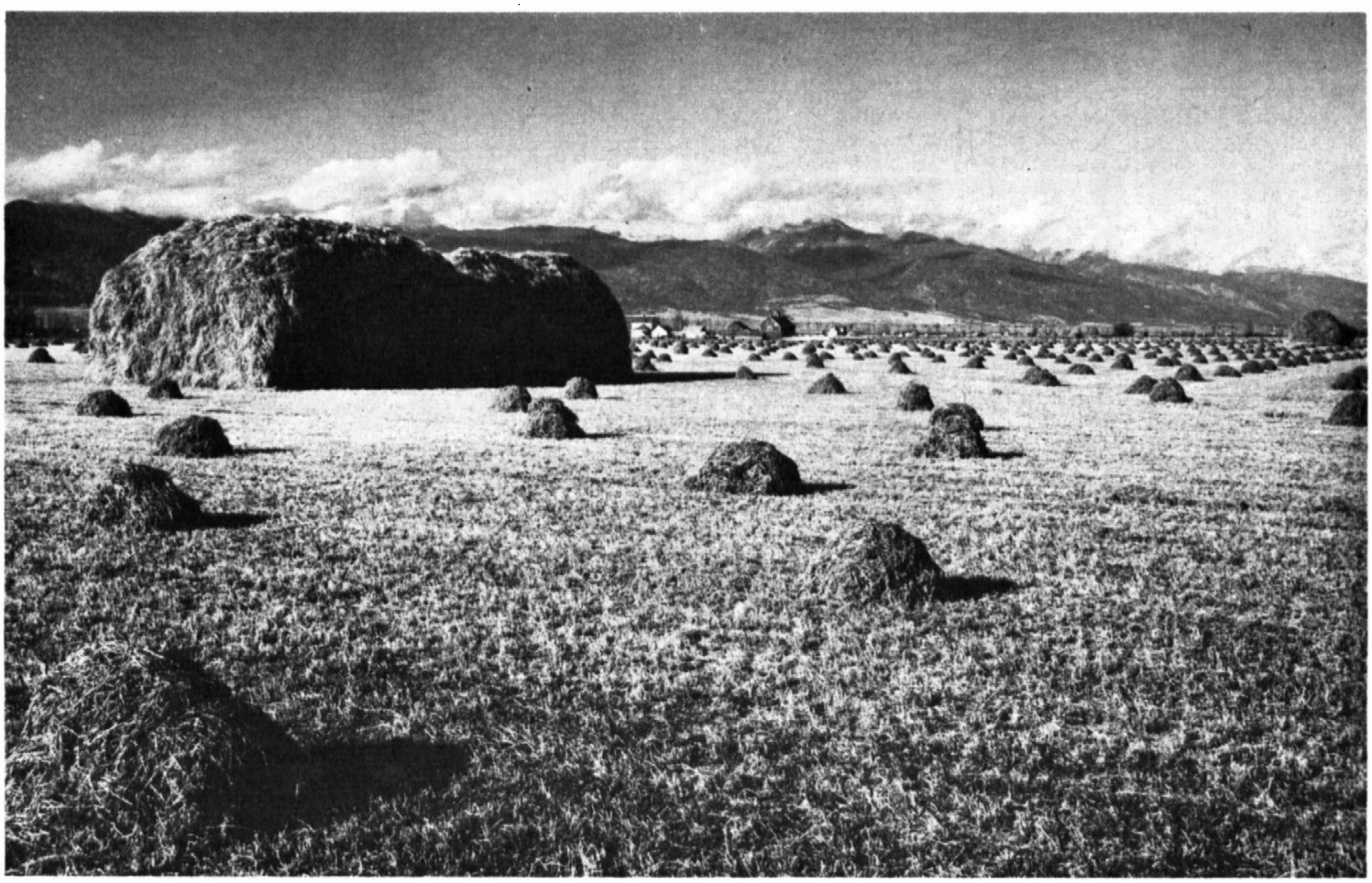

Figure 8.—Alfalfa hay on Hamilton silt loam, level. Bitterroot Mountains in the background; Blodgett-Bass association on benches along base of mountains. Photo by Ernst Peterson.

Hamilton-Corvallis silt loams, level (Hf).—This mapping unit is like Hamilton silt loam, level, except that some profiles have weak mottling or graying in the subsoil. It is as good for agricultural use as Hamilton silt loam, level, and is used and managed in the same way.

Holloway Association, Mountainous

This association consists of mountainous timbered areas underlain by quartzites, argillites, and sandstones of the pre-Cambrian Belt formation. Local differences in elevations may exceed 1,000 feet. Most slopes are steeper than 25 percent. There are rock outcrops on the steeper, more broken slopes, but many of the ridges are rounded and smooth, and some gently sloping saddles and broad ridges are included. The lower boundary of the association is at an average elevation of 5,000 feet. The principal trees are ponderosa pine, Douglas-fir, and lodgepole pine. Ponderosa pine is usually dominant at the lower elevations and on the sunnier, drier sites at the higher elevations. Douglas-fir or lodgepole pine are dominant on shaded slopes and over most of the higher elevations. Lodgepole pine is dominant in many burned-over areas.

The only series in this association that has been named is the Holloway. Holloway soils developed over weathered fine-grained sandstone, quartzite, and argillite of the pre-Cambrian Belt formation. The parent material is local residuum, considerably reworked in most places and probably somewhat mixed with loess.

Profile of Holloway loam:

A_{00} 2 to 0 inches, loose litter of pine needles; 1 to 2 inches thick.

A_0, A_1 0 to 2 inches, dark-brown (dry) to very dark brown (moist) matted and well-decomposed organic matter mixed with soil; strongly acid; contains numerous living and dead fine roots.

B_2 2 to 6 inches, light yellowish-brown (dry) to dark-brown (moist) loam; massive and slightly firm in place, crushes to weak fine and medium crumb structure; soft (dry) to very friable (moist); nonplastic; numerous dark-brown, fine, shotlike concretions, mostly one-eighth of an inch or less in diameter; slightly acid; clear wavy lower boundary; the horizon of greatest root concentration.

C_1 6 to 14 inches, white (dry) to light-gray (moist) massive light loam; contains a few firm pale-yellow (dry) fine subangular blocklike aggregates, probably slightly higher in clay content than surrounding soil; soft (dry) to very friable (moist); strongly acid; fewer roots than in the B_2 horizon; clear wavy lower boundary.

C_2 14 to 30 inches, very pale brown (dry or moist) loams; like the C_1 horizon except that firm blocklike aggregates are more numerous and some are larger; grades to weathered parent rock.

The depth to bedrock ranges generally from 2 to 3 feet. Fairly well defined but very thin A_1 or A_2 horizons are present in some places but are not continuous

Figure 9.—Harvesting sugar beets north of Corvallis on Hamilton-Corvallis sandy loams, level. Photo by Ernst Peterson.

over very large areas. Much of the soil is stony. Included in the association are shallow and deep variants of the Holloway series, some small and some relatively large areas of rock outcrop on steep canyon sides and ridge points, and some soils similar to the Holloway but derived from different parent materials. At the lower elevations there is a series that is similar to the Trapper, described elsewhere, except that the substratum is sandstone, quartzite, or argillite rather than limestone, and the lime horizon is less prominent.

Holloway association, mountainous (Hg).—This mapping unit is used for the production of commercial timber, poles, posts, and firewood. It is also used for grazing. The characteristics of the unit vary too much to allow accurate estimates of potential yields.

Kenspur Series

This is a deep, somewhat sandy, alluvial soil. It is like the Chamokane soils, except that it has more than 36 inches of coherent fine earth over loose sand and gravel and is more productive. The principal areas are on the Bitterroot flood plains in the north end of the valley along the boundary between Ravalli County and Missoula County.

Most of the Kenspur soil is occasionally flooded. During the spring runoff, the water table rises enough to subirrigate the soil, but during the rest of the year it is usually more than 4 or 5 feet below the surface. The profile is generally bright-colored and has few mottles or other signs of restricted drainage. The parent material is recent sandy to loamy alluvium more than 36 inches thick over loose sand and gravel of mixed origin. Like the Chamokane soils, the Kenspur soil has developed under a conifer-cottonwood-grass cover. The normal annual precipitation is about 13 inches. The texture is medium to slightly sandy. There is little horizon differentiation other than that resulting from stratification of the parent material. Permeability is moderate to moderately rapid; moisture-supplying capacity is high. Drainage is good except during the spring period of high water. Natural fertility is moderately high to high.

Profile of Kenspur fine sandy loam:

A_1 0 to 7 inches, grayish-brown (dry) to very dark gray (moist) friable to very friable fine sandy loam; poorly developed crumb structure; neutral to slightly acid; clear boundary between this and the B horizon.

B 7 to 13 inches, grayish-brown (dry) to dark grayish-brown (moist) friable fine sandy loam; poorly defined blocky structure; neutral reaction; gradual transition to C_1 horizon.

C_1 13 to 30 inches, light brownish-gray (dry) to dark grayish-brown (moist) fine sandy loam, stratified with loamy fine sand; neutral reaction; clear boundary between this and the C_2 horizon.

C_2 30 to 36 inches, white (dry) silt loam; when moist, light-gray with weak mottlings of yellowish brown; mildly calcareous; clear boundary between this and the C_3 horizon.

C_3 36 to 50 inches, stratified noncalcareous loamy fine sand and fine sandy loam.

D 50 to 60 inches, loose sand and gravel of mixed origin.

Depth to sand and gravel varies from about 30 inches to 5 or 6 feet or more. Free lime usually occurs only in the finer textured strata, and in many profiles there is none. In some places the surface soil is loam instead of fine sandy loam.

Kenspur fine sandy loam (Ka).—This is the only soil of the Kenspur series mapped in this Area. It was not separated into slope phases. All of the areas are on the Bitterroot flood plains where the general slope is less than 2 percent. The microrelief may be undulating. A few sharp breaks along abandoned channels are included. Most areas receive water from the Bitterroot River through diversion ditches that serve only one or two farms. Season-long delivery every year to all farms cannot be depended upon. Cultivated areas are used chiefly for small grains and hay. Truck crops have been grown successfully. Where the water supply is adequate, yields are fairly high in years in which flooding is not serious. Uncultivated areas are chiefly native wooded pasture. Only a few pastures are seeded and irrigated.

Laporte Series

The Laporte soils are developing from limestone under grass. They occur in the uplands on the east side of the valley. The soils are shallow and stony. Characteristically they have a thin to moderately thick, dark grayish-brown, stony surface soil and a thin, grayish-brown, stony loam subsoil that overlies more or less weathered limestone. Hard limestone, only slightly weathered, is usually within 10 to 20 inches of the surface. Laporte soils are excessively drained and have low moisture-holding capacity.

Laporte stony loam, sloping and strongly sloping (La).—This soil occurs on ridges and slopes of less than 15 percent gradient, in sharply dissected uplands. It is associated with Laporte stony loam, moderately steep and steep. It is used only for grazing.

Laporte stony loam, moderately steep and steep (Lb).—This soil occurs on slopes steeper than 15 percent, next to the coulees. Many of the slopes are broken by rock outcrops. Some protected coves and north-facing slopes have moderately thick mantles of silty material on which some grass grows. However, the areas as a whole are shallow, stony, and sparsely vegetated. They are used only for grazing.

Larry Series

The Larry soils occur on the west side of the valley, chiefly on low fans and terraces. They are associated with the Victor soils. They are moderately fine textured, wet, meadow soils that have developed in noncalcareous, alluvial fine earth that was moderately deep to deep over gravel. They occupy concave foot slopes at the bases of high benches and drainage swales, where conditions favor the accumulation of excess moisture. They developed under a cover of moisture-loving grasses, sedges, rushes, and scattered shrubs.

The Larry soils have thin to moderately thick layers

of peaty muck overlying moderately thick mineral soils; moderately thick, very dark gray, firm clay or clay loam subsoils; and mottled light-gray clay loam substrata. Gravel begins at depths of 20 to 42 inches. These soils are imperfectly to poorly drained, moderately deep to deep, and moderately to moderately slowly permeable. They have high moisture-supplying capacity and moderately high natural fertility.

The Larry soils differ from the Gallatin soils primarily in being noncalcareous and in being on fan-terraces rather than on flood plains. They have thicker horizons of fine earth than the St. Joe soils, which are shallow, wet, meadow soils occurring in the same general area.

Profile of Larry clay loam:

A_{11} 0 to 2 inches, very dark gray (dry) to black (moist) peaty muck; tightly bound by grass roots; slightly acid.

A_{12} 2 to 9 inches, firm clay loam of the same color as the A_{11} horizon; granular structure; high in organic matter; neutral reaction.

B 9 to 17 inches, clay loam of a color similar to that of the A_{12} horizon but not quite so dark; blocky structure; neutral reaction.

G_1 17 to 29 inches, mottled light-gray, pale-yellow, and light yellowish-brown (dry) to gray, light yellowish-brown, and dark yellowish-brown (moist) gritty clay loam; massive structure; contains a few cobblestones and some gravel; neutral reaction.

G_2 29 to 36 inches, mottled light-gray and gray (dry) to light brownish-gray and dark-gray (moist) gritty clay loam; massive structure; cobblestones and pebbles a little more numerous than in the G_1 horizon.

The color of the surface soil (dry) ranges from dark grayish brown to very dark gray. The total thickness of the dark layers varies from 14 to 30 inches. In some places gravel is abundant below a depth of 15 inches, and it may be present in the surface soil. Moisture content varies widely from season to season. Some areas are wet all of the time. Others have been artificially drained and are only slightly wet.

Larry clay loam, level (Lc).—This is the unit most nearly typical of the Larry series. It occurs on concave slopes of less than 2 percent. All areas are too wet to cultivate in the spring. Some are wet all season, but others may need irrigation during the summer for maximum production. All areas are used for wild hay or pasture. A few of the wettest spots do not produce useful vegetation.

Larry clay loam, drained, level (Ld).—This soil is like Larry clay loam, level, except that it is artificially drained by open ditches. The present drainage varies from moderately good to imperfect. Most of the areas have been plowed and cultivated to small grains and mixed grass-and-clover hays (fig. 10). One area has

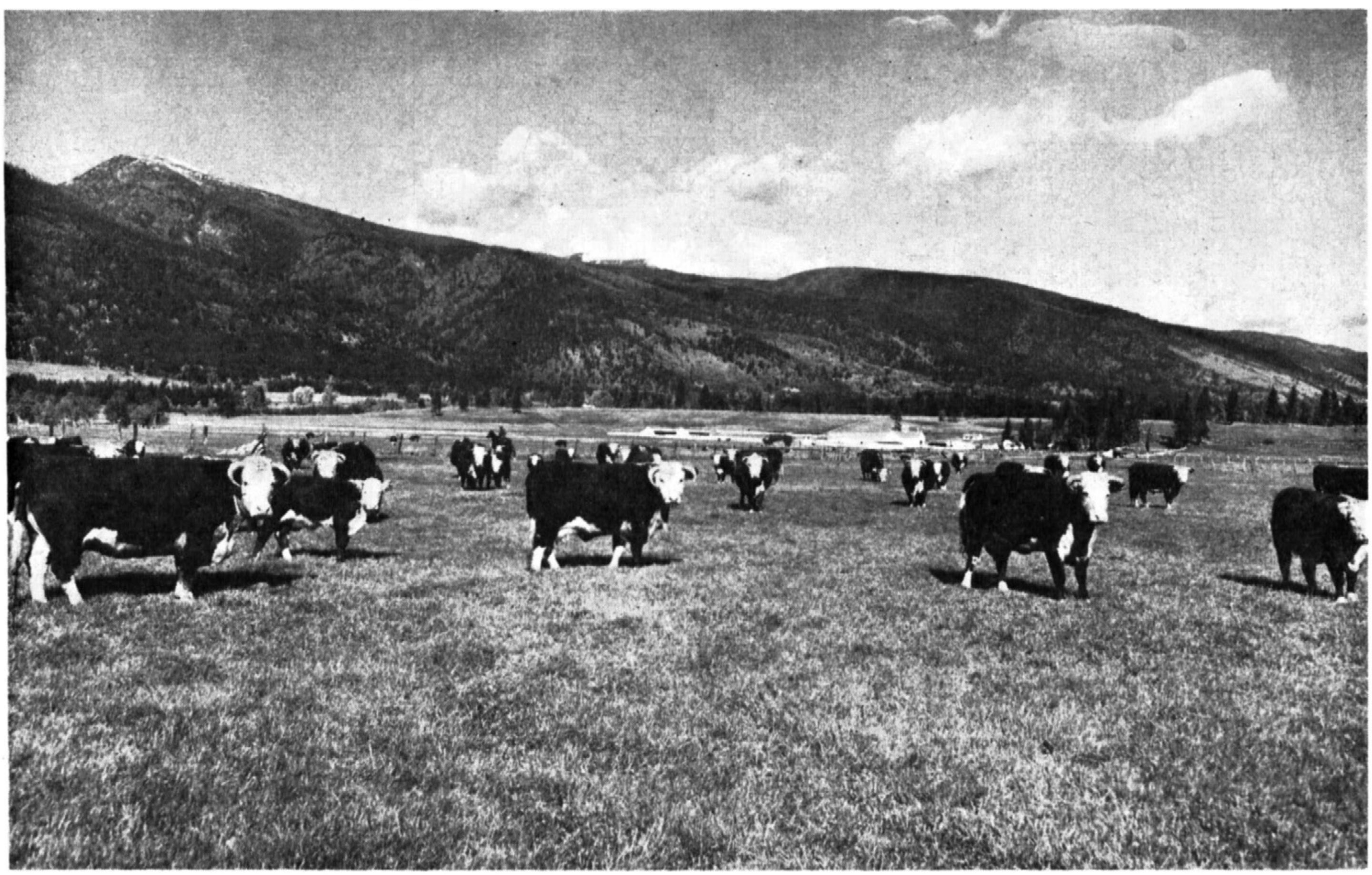

Figure 10.—Purebred Hereford cattle in an irrigated meadow on drained phases of Larry clay loam and St. Joe clay loam. Benches of Blodgett, Bass, and Como soils lie behind the buildings; the Bitterroot Mountains are in the background. Photo by Ernst Peterson.

been used successfully for sugar beets. Careful management is needed to maintain a balance between drainage and irrigation.

Larry clay loam, drained, gently sloping (Le).—This mapping unit is like Larry clay loam, drained, level, except that it occurs on concave or smooth slopes of 2 to 5 percent. The two phases are used and managed similarly.

Larry clay loam, gently sloping (Lf).—This soil differs from Larry clay loam, level, only in being on smooth to concave slopes of 2 to 5 percent. It is used for wild hay and pasture.

Larry clay loam, sloping (Lg).—This soil is like Larry clay loam, level, except that it is on slopes of 5 to 9 percent. Some of the areas are on the edges of the higher benches, where they are associated with Bass and Blodgett soils. They are used for wild hay and pasture.

Larry silt loam, level (Lh).—This soil is like Larry clay loam, level, except that it has a silt loam rather than a clay loam surface soil and a somewhat coarser textured subsoil. It occurs on smooth to concave slopes of less than 2 percent. It is imperfectly to poorly drained. It is used for wild hay and pasture.

Larry silt loam, drained, level (Lk).—This soil is like Larry silt loam, level, but it is artificially drained by open ditches. It varies from moderately well drained to imperfectly drained. Most of the unit has been plowed and used for small grains and mixed grass-and-clover hay. Yields, particularly of small grains, depend on drainage.

Larry silt loam, gently sloping (Ll).—This soil differs from Larry silt loam, level, only in being on smooth to concave slopes of 2 to 5 percent. It is used for wild hay and pasture.

Larry silt loam, drained, gently sloping (Lm).—This soil differs from Larry silt loam, drained, level, only in being on slopes of 2 to 5 percent. It has been artificially drained and is used for small grains and mixed grass-and-clover hay.

Larry silt loam, sloping (Ln).—This soil is like Larry silt loam, level, except that it is on slopes of 5 to 9 percent. Some of the areas are on the edges of the high benches and are associated with Bass and Blodgett soils. This soil is used for wild hay and pasture.

Lick Series

The Lick soils occur in the forested areas of the west-side high benches. They have a light-colored surface layer and a brown subsoil that appears "reddish brown" when compared with other soils of the Area. The parent materials are very strongly weathered granitic outwash or glacial till. These soils are mostly near Darby, on nearly level to sloping remnants of high terraces, and on higher, more strongly rolling areas that are presumably of glacial till origin but may be eroded terraces. The soils developed under dense coniferous forests. The normal annual precipitation is more than 17 inches. The growing season is relatively short. Small grains may or may not have time to mature.

The Lick soils have light-colored, moderately thick to thick surface soils; moderately thick, strong-brown, compact, gritty clay loam subsoils; and strongly weathered gritty loam substrata containing many rotten cobblestones and boulders. They are deep, moderately permeable, and well drained. The moisture-supplying capacity is good. Natural fertility is low. The surface soils are extremely erosive and may be lost rather quickly if improperly irrigated.

The Lick soils have more strongly developed and less silty profiles than the associated Gorus soils. They have finer textured and browner subsoils than the Como soils, which have developed in loose cobbly and gravelly materials in the same environment. The Charlos soils, which have developed in similar materials but under grass, have much darker surface soils.

Profile of Lick loam:

A_0 1 to 0 inches, dark grayish-brown (dry) to black (moist) matted duff consisting mostly of pine needles.

A_1 0 to 1 inches, dark grayish-brown (dry) to very dark gray (moist) friable loam; clear transition to A_2 horizon.

A_2 1 to 8 inches, very pale brown (dry) to pale brown (moist) friable loam; strong medium platy structure; medium acid; clear boundary between this and A_3 horizon.

A_3 8 to 15 inches, very pale brown (dry) to pale brown (moist) friable loam streaked with brown; moderate fine subangular blocky structure; medium acid; clear transition to B_2 horizon.

B_2 15 to 21 inches, reddish-yellow (dry) to strong-brown (moist) sticky gritty clay loam; strong medium blocky structure; structure faces are darker in color; compact; slightly acid; gradual transition to C horizon.

C 21 to 48 inches, coarsely mottled yellowish-brown, brown, and very pale brown (moist) gritty loam; contains many embedded rotten granitic cobblestones and boulders.

The number and size of stone fragments in these soils vary considerably. Stone-free and gravelly, cobbly, and stony soils occur within rather limited areas. Small areas that have strong coarse columnar structure in the subsoil are common.

Lick loam, gently sloping (Lu).—This soil occurs on slopes of 2 to 5 percent. A few areas have lost part of the surface soil by erosion caused by careless irrigation of fallow land. Nearly all areas have been cleared and plowed. Most of them are used for irrigated pastures or mixed grass-and-clover hay. Yields are not very high unless very heavy applications of manure and commercial fertilizers are used. Small grains are grown only when it is necessary to re-establish stands of hay or pasture. Some areas are untended.

Lick loam, sloping (Lw).—This soil occurs on slopes of 5 to 9 percent. Several areas have been moderately to severely eroded as a result of careless irrigation. In spots the clay loam subsoil is within plow depth. Most of this soil has been cleared and is farmed. Where enough irrigation water is available, the soil is used principally for mixed grass-and-clover hay or irrigated pasture. Small grains are grown only when the ground is being prepared for reseeding pastures.

Areas that are short of irrigation water are used for cultivated crops more frequently. These areas are eroded. Some of this soil is idle or is still in abandoned remnants of the apple orchards that once covered many of these areas. A few areas are in second-growth timber.

Lick loam, strongly sloping (Lx).—This soil occurs on slopes of 9 to 15 percent. Some areas have been moderately to severely eroded. This soil is used in the same way as Lick loam, sloping, except that a larger part of it is in second-growth timber.

Lick loam, moderately steep (Ly).—This soil occurs on slopes of 15 to 25 percent. Much of it is in timbered areas, which may include small gravelly or stony areas and more gently sloping ridges. Most of these areas are along the upper reaches of the East and West Forks of the Bitterroot River. No water for irrigation is available, and the growing season is too short for small grains to mature. Many small areas that are associated with Lick loam, sloping, and Lick loam, strongly sloping, have been cleared and are used in the same ways as those phases. Most such areas are eroded.

Lick gravelly loam, gently sloping (Lo).—This soil occurs on slopes of 2 to 5 percent. It is like the profile described for the series, except for the gravel content of the surface layer. Most areas have been cleared and plowed. They are used principally for irrigated pasture and mixed grass hays, and they are seldom tilled.

Lick gravelly loam, sloping (Lp).—This soil occurs on slopes of 5 to 9 percent. It is used in the same way as Lick gravelly loam, gently sloping.

Lick gravelly loam, strongly sloping (Lr).—This soil occurs on slopes of 9 to 15 percent. Most areas are in second-growth timber or cutover, untended pasture.

Lick gravelly loam, moderately steep (Ls).—This soil occurs on slopes of 15 to 25 percent. It is in second-growth timber or cutover, untended pasture.

Lick stony loam, sloping (L2b).—This soil is on slopes of 5 to 9 percent. It is too stony to be cultivated. Except for the stoniness, the profile is like that described for the series. The areas are mostly in second-growth timber. A few are within cleared fields of other soils.

Lick stony loam, strongly sloping (L2c).—This soil has a stony surface layer and is on slopes of 9 to 15 percent. It is mostly in second-growth timber.

Lick stony loam, moderately steep (L2d).—This soil has a stony surface layer and is on slopes of 15 to 25 percent. It occurs mostly on the upper part of the benches, where the terrain is more rugged. It is in second-growth timber.

Lick stony loam, steep (L2e).—This soil is on slopes steeper than 35 percent. Most areas are bench edges or coulee slopes. They are in second-growth timber.

Lick Series, Imperfectly Drained Variant

The imperfectly drained variants of the Lick series are slightly to moderately wet because they have received seepage from irrigation canals and higher lying irrigated areas for the past 40 to 50 years. They occupy relatively small areas around drain heads and on slopes below dissected high fans and glacial moraines. The soils developed under forest cover in old strongly weathered granitic materials.

These soils have thin, dark-colored surface horizons matted with roots; and moderately thick, light-gray, generally weakly mottled, friable loam subsurface horizons. Their moderately thick, heavy loam or clay subsoils are yellowish brown, prominently mottled with grays, pale yellow, and dark brown. The gritty loam substrata are about the same color as the subsoil, or more gray. Relatively impermeable strata, in many places bedrock, apparently are within 5 to 10 feet of the surface. These soils are deep and moderately permeable. They have high moisture-supplying capacity and low natural fertility. They are poorly to imperfectly drained.

Lick loam, imperfectly drained variant, level (Lt).—This soil occurs on slopes of less than 2 percent on the high benches. It is associated with other Lick soils. A few small stony areas are included. This soil is mostly cleared, but it is not cultivated because it is too wet. It is used for pasture and wild hay. The vegetation is chiefly sedges and swampgrasses.

Lick loam, imperfectly drained variant, gently sloping (Lv).—This soil also occurs on the high benches in association with the Lick soils. Slopes are smooth and concave, and they range from 2 to 5 percent. A few small stony areas are included. Although mostly cleared, this soil is too wet to be cultivated. It is used for pasture and wild hay. The vegetation is largely sedges and swampgrasses.

Lick loam, imperfectly drained variant, sloping (Lz).—This soil occurs on smooth and concave slopes of 5 to 9 percent. It includes small stony areas. It is used in the same way as the level and gently sloping phases.

Lick loam, imperfectly drained variant, strongly sloping (L2a).—This soil occurs mostly on slopes of 9 to 15 percent, but in a few places slopes are steeper. Some small areas are stony. This soil is used in the same way as the other imperfectly drained Lick soils.

Lolo Series

The Lolo soils are noncalcareous soils developed in mixtures of gravel and fine earth. They occur on low fan-terraces along Lolo and Eightmile Creeks. The parent materials are flat argillite and quartzite gravel and cobblestones filled with fine earth to depths of 20 to 36 or more inches. The soils developed under grassland vegetation. The normal annual precipitation is 14 to 17 inches, and the growing season is relatively long.

The Lolo soils have moderately thick to thick, very dark grayish-brown to very dark brown gravelly or cobbly loam surface soils, and moderately thick to thick, brown, friable to very friable gravelly loam subsoils. The pale-brown, very friable gravelly sandy loam substrata merge into loose gravel at depths of 30 to 48 inches. These soils are moderately deep. Permeability is moderately rapid in the subsoils, and rapid in the substrata. The moisture-supplying capac-

ity is low to moderately high. For gravelly soils, they have unusually high natural fertility.

The Lolo soils are darker colored than the Dominic, Grantsdale, or Victor soils. They contain more fine earth than the Dominic soils, and they have more gravel in the upper horizons than most Grantsdale and Victor soils. The gravel in the Lolo soils is derived from argillites and quartzites rather than from mixed or granitic material.

The Lolo soils show only weak profile development. A profile of Lolo gravelly loam is described below.

- A_1 0 to 12 inches, dark grayish-brown (dry) to very dark brown (moist) friable gravelly loam; moderate medium crumb structure; merges with B horizon.
- B 12 to 18 inches, pale-brown (dry) to brown (moist) friable to very friable gravelly light loam; weak medium blocky structure; gradual transition to C_1 horizon.
- C_1 18 to 34 inches, very pale brown (dry) to pale-brown (moist) very friable gravelly sandy loam; noncalcareous; merges with C_2 horizon.
- C_2 34 to 48 inches, sand, gravel, cobbles, and a little fine earth; some of the cobbles are coated with lime on the underside.

The surface soil ranges up to 20 inches in thickness. In some places it is somewhat lighter colored than typical. Small spots may have moderately well defined lime carbonate horizons.

Lolo gravelly loam, level (L2g).—This soil occurs on slopes of less than 2 percent. It occupies most of the low fan-terrace of Lolo Creek. It has somewhat more fine earth in the profile than is typical. Even so, the surface soil averages 25 to 35 percent gravel by volume. All of this soil is irrigated and cultivated. The principal crops are alfalfa, small grains, corn, potatoes, and other truck crops. Yields are relatively high.

Lolo gravelly loam, gently sloping (L2h).—This soil occurs on low fan-terraces having slopes of 2 to 5 percent. Most areas are along Eightmile Creek. The surface soils are gravelly loams that contain scattered cobblestones. At the lower end of the fan, the soils are somewhat lighter colored than typical. This soil is used in the same way as Lolo cobbly loam, gently sloping.

Lolo cobbly loam, gently sloping (L2f).—This soil occurs on fans that are smooth except for some old channelways and local irregularities. Slopes range from 2 to 5 percent. Cobblestones on the surface interfere with cultivation. The principal areas are along Eightmile Creek. There is not enough water for all of the irrigable land. The irrigated areas are used mostly for alfalfa hay but are sometimes used for seed peas or small grains. With enough water, fairly high yields are obtained. Light but frequent irrigation is best. However, because of the rapid permeability of the soil, it is difficult to get water over the ground quickly. Most nonirrigated areas are seeded to crested wheatgrass or other perennial grasses and used for range.

Lone Rock Series

The Lone Rock soils occur chiefly on low fan-terraces along Threemile Creek. They developed under grassland vegetation. The normal annual precipitation is 11 to 14 inches, and the growing season is fairly long. The parent materials of the Lone Rock soils were derived chiefly from weathered gneiss and granite. They consist of subangular and rounded fine gravel and of fine earth that contains a large proportion of quartz and other mineral grains.

The Lone Rock soils have moderately thick, very dark grayish-brown, very friable sandy loam or cobbly loam surface soils; moderately thick, dark-brown, very friable, gritty sandy loam subsoils; and a noncalcareous, loose, coarse sand and fine gravel substratum. The soils are shallow, rapidly permeable, and droughty. They have low to very low moisture-supplying capacity and low natural fertility. Drainage is somewhat excessive. No free lime carbonate remains in the soils.

The Lone Rock soils have slightly lighter colored surface layers and less fine earth in the subsoils than the Victor soils. The alluvium from which Victor soils developed was derived from similar rocks but was not weathered before it was deposited. Lone Rock soils have much less coarse gravel and fewer cobblestones in the profile than the Dominic soils, which were developed on terraces of the east side from materials derived from sedimentary rocks. The color of the surface layer is about the same in Lone Rock as in Grantsdale soils, but the Grantsdale were developed in fine earth over gravel and have horizons in which calcium carbonate has accumulated.

These soils have weakly developed profiles. Profile of Lone Rock coarse sandy loam:

- A_p 0 to 7 inches, grayish-brown (dry) to very dark grayish-brown (moist) coarse sandy loam; weak fine crumb structure; soft (dry) to very friable (moist); neutral reaction; clear boundary between this and B_2 horizon.
- B_2 7 to 13 inches, brown (dry) to dark-brown (moist) coarse sandy loam; weak medium and fine subangular blocky structure; soft (dry) to very friable or friable (moist); neutral reaction; gradual transition to D horizon.
- D 13 to 36 inches, pinkish-gray (dry) to brown (moist), loose, mostly fine gravel, coarse sand, and medium sand; noncalcareous.

The horizons of sandy loam range from about 10 to about 24 inches thick over the coarse substrata. Some areas of cobbly soils are included. Some of the coarse fragments are argillite or quartzite, although the parent material was derived from a different kind of rock.

Lone Rock coarse sandy loam, level (L2m).—This is the most extensive and the most nearly typical soil of the series. It occurs in large areas on the fan-terraces of Threemile Valley and in smaller areas elsewhere. Slopes are less than 2 percent. Almost all of the soil is irrigated. It is extremely droughty and is likely to be dry at some time during the summer, even where plenty of water is available for irrigation. Many of the areas are in small farms. Small grains, alfalfa, potatoes, truck crops, and small fruits are the principal crops. Some areas are used for irrigated pasture. Sugar beets have been grown, but they return very low yields. Yields of other crops vary, but they are generally low in comparison with yields from other east-side soils. Droughtiness is the limiting factor.

Lone Rock coarse sandy loam, gently sloping (L2n).—This soil occurs on smooth fan-terraces in association with Lone Rock coarse sandy loam, level. Slopes range from 2 to 5 percent. This soil is used in the same way as the level phase and has the same limitations.

Lone Rock coarse sandy loam, sloping (L2o).—This soil is like Lone Rock coarse sandy loam, level, except that it is on slopes of 5 to 9 percent. More hay and pasture crops are grown, but otherwise this soil is used in the same way as the level phase.

Lone Rock cobbly coarse sandy loam, level (L2k).—This soil occurs on relatively smooth areas of less than 2 percent slope. It has a liberal sprinkling of cobblestones on the surface. Though a nuisance, the stones do not prevent cultivation. This soil is used in the same way as Lone Rock coarse sandy loam, level.

Lone Rock Series, Dark-Colored Variant

The dark-colored variant of the Lone Rock series developed on terraces in sandy fine earth over mixed gravels. It occurs near Conner and in Sula Basin, where it is associated with the sandy subsoil variant of the Gird series. It developed under grassland vegetation. The growing season is relatively short, and the normal annual precipitation is 16 to 18 inches.

This soil has a moderately thick, very dark grayish-brown, friable fine sandy loam surface soil; a moderately thick, brown to pale-brown, very friable sandy loam subsoil; and a loose sand and gravel substratum. It is shallow to moderately deep, moderately rapidly permeable, and somewhat excessively drained. It has low moisture-supplying capacity and low natural fertility.

This variant differs from the typical Lone Rock soils in having a darker colored surface soil and more fine and very fine sand in the upper horizons. It differs from the sandy subsoil variant of the Gird series in being on terraces rather than on uplands and in being shallow over gravel rather than deep over granite.

Lone Rock fine sandy loam, dark-colored variant, level (L2l).—This soil occurs on terraces of less than 2 percent slope. Nearly all of it is irrigated. In Sula Basin it is used for alfalfa hay. At Connor it is used for general farming, and alfalfa and small grains are the major crops.

Maiden-Gird Complex

The Maiden-Gird complex is an association of friable soils developed in weathered limestone and in wind-deposited silts over limestone on the east-side uplands. These soils developed under grass. The normal annual precipitation is 14 to 16 inches. The two soils differ very little in agricultural use.

The soils are moderately deep to deep over bedrock, moderately permeable, and well drained. They have high moisture-supplying capacity and high natural fertility. In a few spots limestone is very near the surface and a few rock fragments may be scattered on the surface, but the rocks do not interfere with cultivation.

The Maiden soils are like the Skaggs soils, except that they have very dark grayish-brown rather than black surface soils. The Gird soils are similar to those described under the Gird series.

Maiden-Gird silt loams, gently sloping (Ma).—This mapping unit occurs on relatively smooth bench slopes of 2 to 5 percent gradient, cut in the bedrock. None of it is irrigated. Most of it has been plowed and is being used for small grains, chiefly wheat, under an alternate crop and fallow system. Some has been reseeded to crested wheatgrass or other perennial grasses to be used for hay or pasture. Areas in native sod are used for grazing.

Maiden-Gird silt loams, sloping (Mb).—This mapping unit occurs in the same localities as Maiden-Gird silt loams, gently sloping, but it is on slopes of 5 to 9 percent. It is used in the same way as the gently sloping phase, although it is steeper and more susceptible to erosion.

Maiden-Gird silt loams, strongly sloping (Mc).—This mapping unit occurs on slopes of 9 to 15 percent. It is associated with the other phases of the complex. It is used in about the same way as the gently sloping phase, but is much more likely to erode because of the steeper slopes.

Maiden-Gird silt loams, moderately steep (Md).—This mapping unit occurs on slopes of 15 to 25 percent. It is generally too steep for cultivation. Most of it is in native sod and used for grazing.

Peat Soils

The Peat soils developed in thick layers of decomposing plant remains. They occur in marshes or areas that once were marshes, where the native vegetation has been mostly reeds, sedges, and willows. In Ravalli County, the largest areas are south of Hamilton at Camas Creek and along Burnt Fork Creek east of Stevensville. Some of these areas have been drained, so that at present drainage varies from very poor to moderately good. The very poorly drained areas are shown on the soil maps by marsh symbols.

Profile of Peat:

1. 0 to 8 inches, very dark grayish-brown (dry) to black (moist) fibrous peat; noncalcareous.
2. 8 to 14 inches, very dark grayish-brown, well-decomposed, compact peat; noncalcareous.
3. 14 to 32 inches, very dark grayish-brown peat; more fibrous and less compact than the horizon above; noncalcareous.
4. 32 to 50 inches, very dark grayish-brown peaty muck; noncalcareous.
5. 50 to 60 inches, gray (moist) massive silty clay loam.

The degree of decomposition and the amount of stratification vary from area to area. The depth to mineral soil ranges from about 20 to more than 60 inches. Some areas are underlain by gravel rather than fine earth.

Use and management of Peat soils varies with the degree of drainage that has been established. Undrained areas are pasture or wasteland. Partly drained areas are used for pasture or native hay. The

better drained areas are farmed a little. The most common rotation is small grains, usually oats, and grass hay. Intensive cultivation of these soils has not been tried.

Peat (Pa).—The peat in this mapping unit is more than 36 inches deep over mineral soil. Use and management are as described for the series.

Peat, shallow over silt (Pb).—This peat is 20 to 36 inches thick over fine earth of silt to silty clay loam texture. Use and management are as described for the series.

Peat, shallow over gravel (Pc).—In this mapping unit, the peat is 20 to 36 inches deep over gravel. Use and management are as described for the series.

Poverty Series

The Poverty soils are imperfectly to poorly drained light-colored soils that developed under forest. The parent material was gravelly and cobbly granite, schist, and gneiss material that contained a little material derived from other rocks, chiefly argillites. These soils occur on the west side of the valley. They occupy low alluvial fans that have poor surface drainage. Internal drainage is restricted. Runoff and seepage from other soils keep these soils wet for long periods in spring and early in summer.

The Poverty soils have very thin organic mats over the thin, grayish-brown, friable surface soils. The subsoils are moderately thick, distinctly mottled, friable cobbly loam or cobbly clay loam. The substrata of mottled sand and gravel begin within 20 inches of the surface. The soils are shallow to very shallow. The subsoils are moderately permeable, and the substrata are very rapidly permeable. The moisture-supplying capacity is low to very low, and the natural fertility is very low.

The Poverty soils are like the Chereete and Como soils, except that they are imperfectly drained. They are lighter colored, generally more cobbly, and shallower than the St. Joe soils.

Profile of Poverty cobbly loam:

A_0 2 to 0 inches, dark-colored mat of organic matter and roots.

A_2 0 to 4 inches, light-gray (dry) to grayish-brown (moist) friable cobbly loam; weak medium subangular blocky structure; slightly to moderately acid; gradual transition to next horizon.

B_2 4 to 11 inches, light-gray (dry) to grayish-brown with numerous distinct mottles of yellowish brown and strong brown (moist) cobbly loam; gradual transition to next horizon.

B_3 11 to 18 inches, distinctly mottled brown, yellowish-brown, reddish-brown, and gray (moist) cobbly sandy loam; weak subangular blocky structure; merges with next horizon.

C 18 to 30 inches, faintly mottled sand and gravel; dominantly unweathered igneous material.

Like many other soils that have restricted drainage, the Poverty soils are not uniform over any appreciable area. The surface layer is light colored as long as the soils are forested, but darkens rapidly if the soils are cleared and seeded to permanent grasses. Some areas contain only a few coarse rock fragments in the upper part of the profile. The underlying gravel on the high benches is weathered.

Poverty cobbly loam, level (Pd).—This soil occurs in swales and on smooth slopes of less than 2 percent on low fans and terraces of the west side. It is associated with the Chereete soils. It is generally wet in the spring, but, unless irrigated, it becomes dry and droughty in summer. Most areas have been cleared. They are seldom tilled but are used for native grass, hay, and pasture. Some areas are untended.

Poverty cobbly loam, gently sloping (Pe).—This soil occurs on smooth and concave slopes of 2 to 5 percent. It is associated with Chereete and Como soils on low fans, terraces, and high benches on the west side. It is used in the same way as Poverty cobbly loam, level.

Poverty cobbly loam, sloping (Pf).—This soil occurs on smooth and concave slopes on high benches on the west side of the valley. It is associated with Como soils. The predominant slope range is 5 to 9 percent, but a few slopes steeper than 9 percent are included. This soil is used in the same way as Poverty cobbly loam, level.

Poverty loam, gently sloping (Pg).—This soil occurs in swales and on smooth slopes of less than 5 percent on low fans and terraces on the west side of the valley. It is associated with Chereete soils. It differs from other soils of the Poverty series in having a relatively stone-free loam surface soil. Most of this soil has been cleared. It is used mostly for grass hay and pasture. At long intervals, it is plowed and planted to small grain. Although wet in the spring, it tends to dry out in summer unless it is irrigated.

Poverty coarse sandy loam, level (Ph).—This soil occurs on concave and smooth slopes of less than 2 percent on low fans and terraces on the west side of the valley. It has coarse sandy loam surface soils that are relatively cobble-free. Its subsoils are more sandy than those described for the series. The soil is used in the same way as Poverty loam, gently sloping.

Poverty coarse sandy loam, gently sloping (Pk).—This soil occurs on concave to smooth slopes of 2 to 5 percent on low fans and terraces and high benches on the west side of the valley. It is like Poverty coarse sandy loam, level, except for the slope. It is used in the same way as Poverty loam, gently sloping.

Poverty coarse sandy loam, sloping (Pl).—This soil occurs on concave and smooth slopes of 5 to 9 percent on west-side fans and benches. Slopes are steeper than 9 percent in a few places. It differs from the other phases of Poverty coarse sandy loam only in slope. It is used mostly for grass hay and pasture.

Poverty very stony coarse sandy loam, gently sloping (Pm).—This soil occurs on slopes of less than 5 percent on west-side fans and benches. Stones in the surface layer make tillage difficult or impossible. The soil is used for native grass hay and pasture.

Poverty very stony coarse sandy loam, sloping (Pn).—This soil occurs on slopes of 5 to 9 percent on west-side fans and benches. Slopes are steeper than 9 percent in a few places. It is too stony to be tilled. It is used for pasture and grass hay.

Ravalli-Bitterroot Complex, Shallow

The Ravalli-Bitterroot complex, shallow, is an association of claypan and friable soils that are less than 20 inches deep over consolidated and relatively impervious sandstones of late Tertiary age. They occur on high benches on the east side of the valley. They developed under grass. The normal annual precipitation is less than 14 inches. The claypan Ravalli soils, locally called "slick spots," occupy 30 to 45 percent of the areas; the friable Bitterroot soils take up 20 to 40 percent; and soils intermediate between the two make up the remainder. The soils occur in such an intricate pattern that they cannot be separated, even on detailed soil survey maps.

The Ravalli soils in this complex have thin or very thin, friable, dark grayish-brown surface soils. The moderately thick, strongly columnar, brown clay loam subsoils may rest directly on hard sandstone, or may be separated from it by a few inches of reasonably friable, calcareous silt loam. The subsoil in many places contains sandstone fragments. These soils are shallow to very shallow and very slowly permeable. They are low in inherent fertility and difficult to manage. They are naturally well drained, but they may become too wet when irrigated.

The Bitterroot soils in these associations have moderately thick, very dark grayish-brown, friable surface soils; moderately thick, brown, friable silt loam subsoils; and pale-brown, friable, calcareous substrata. The hard sandstone lies at depths of less than 20 inches. These soils are shallow, but they are moderately permeable above the sandstone. They have moderately high moisture-holding capacity and high natural fertility. They are naturally well drained but may become wet under irrigation.

Both the Ravalli and Bitterroot soils of this complex differ from Ravalli and Bitterroot soils of normal depth because they are underlain by impervious sandstone at less than 20 inches rather than by permeable loams that extend below 36 inches.

Ravalli-Bitterroot cobbly loams, shallow, gently sloping (Ra).—These soils occur on convex or smooth slopes of 2 to 5 percent. The surface layers are cobbly enough to be difficult to cultivate. Even though most of the areas are below irrigation canals, many are not irrigated and are being used only for native range. The irrigated areas are mostly in bluegrass pasture.

Ravalli-Bitterroot cobbly loams, shallow, sloping (Rb).—These soils occur on convex or smooth slopes of 5 to 9 percent. They are too cobbly to be suitable for cultivation. They are used in the same way as Ravalli-Bitterroot cobbly loams, shallow, gently sloping.

Ravalli-Bitterroot cobbly loams, shallow, strongly sloping (Rc).—This mapping unit occurs on slopes of 9 to 15 percent. It is too cobbly to be suitable for cultivation. It is used for pasture, usually without irrigation.

Ravalli-Bitterroot loams, shallow, gently sloping (Rd).—This mapping unit occurs on slopes of 2 to 5 percent. It is easy to cultivate, but it is used mostly for irrigated pasture and mixed grass-and-legume hay, because the slick spots are hard to manage and the soils become too wet when irrigated.

Ravalli-Bitterroot loams, shallow, sloping (Re).—This mapping unit occurs on slopes of 5 to 9 percent. It is steeper than the gently sloping phase, but it is used in the same way.

Ravalli-Bitterroot loams, shallow, strongly sloping (Rf).—This unit is like the other phases of Ravalli-Bitterroot loams, shallow, except that the slopes range from 9 to 15 percent. It is used in the same way as the other phases.

Riverside Series

The Riverside series is composed of gravelly and cobbly soils that have no horizons of lime accumulation. They occur on old high fan-terraces and terrace borders on the east side of the valley. Coarse fragments in the soil are mostly well-rounded quartzites and argillites, mixed with some granites and gneisses. There is enough fine earth in these soils to give them fair coherence, but the substratum is loose sand, gravel, and cobblestones. These soils developed under grass. The normal annual precipitation is less than 14 inches, and the growing season is comparatively long.

The Riverside soils have moderately thick, very dark grayish-brown surface soils; moderately thick, brown, very friable gravelly sandy loam subsoils; and substrata of loose sand, gravel, and cobblestones. They are shallow and somewhat excessively drained. The subsoils are rapidly permeable, and the substrata are very rapidly permeable. The soils have low moisture-supplying capacity and low to moderately high natural fertility. They need frequent irrigation.

The Riverside soils are the loose, gravelly associates of the Burnt Fork series.

Profile of Riverside cobbly sandy loam:

A_{11} 0 to 2 inches, grayish-brown (dry) to dark grayish-brown (moist) cobbly sandy loam; weak medium crumb structure; very friable (moist) to soft (dry); neutral reaction.

A_{12} 2 to 8 inches, grayish-brown (dry) to very dark grayish-brown (moist) cobbly sandy loam; very weak coarse subangular blocky structure which crushes to weak medium crumb structure; very friable (moist) to soft (dry); neutral reaction.

B_2 8 to 15 inches, pale-brown (dry) to brown (moist) gravelly sandy loam; weak coarse subangular blocky structure; very friable (moist) to soft (dry); neutral reaction.

C 15 to 42 inches, loose sand, gravel, and cobbles, predominantly quartzite and argillite mixed with some granite and gneiss; most of the coarse fragments are hard and only moderately weathered.

The sizes and amounts of coarse fragments on the surface and in the profile vary considerably. Depth to the loose gravelly material varies from 3 feet to many feet. In places, lime carbonate undercoats some of the fragments.

Riverside cobbly sandy loam, gently sloping (Rk).—This soil occurs on slopes of 2 to 5 percent. It can be cultivated. It is somewhat more droughty than Riverside cobbly loam, gently sloping, but is used for the same crops.

Riverside cobbly sandy loam, sloping (Rl).—This soil is like Riverside cobbly sandy loam, gently sloping, but it is on slopes of 5 to 9 percent. It is used in the same way as the gently sloping phase.

Riverside gravelly sandy loam, gently sloping (Rr).—This soil occurs on slopes of less than 5 percent. It has a gravelly sandy loam to gravelly loamy sand surface layer. It has a somewhat looser subsoil than most of the other soils of the Riverside series. Most of it is cultivated. Pasture, alfalfa, and small grains are the chief crops. Some apple orchards still remain. Nonirrigated areas are in native range.

Riverside gravelly sandy loam, sloping (Rs).—This soil occurs on slopes of 5 to 9 percent. It is otherwise like Riverside gravelly sandy loam, gently sloping, and has the same uses.

Riverside gravelly and cobbly sandy loams, strongly sloping (Rp).—Soils in this mapping unit have either gravelly or cobbly surface layers. The difference between them is slight, and they are used in the same way. They occur on slopes of 9 to 15 percent. The most common use is pasture, but occasionally hay or small grains are grown. A few apple orchards still remain.

Riverside fine sandy loam, gently sloping (Rm).—This soil occurs on slopes of less than 5 percent. Its surface is relatively free of cobblestones. There are also fewer cobblestones in the subsoil and substratum than is typical of the series. Most of this soil is irrigated and cultivated. All crops common to the valley, except sugar beets, are grown. The principal crops are alfalfa, small grains, and pasture. The formerly extensive apple orchards are mostly gone. Areas that are not irrigated are in native range.

Riverside fine sandy loam, sloping (Rn).—This soil differs from Riverside fine sandy loam, gently sloping, only in being on slopes of 5 to 9 percent. It is used in the same way as the gently sloping phase.

Riverside fine sandy loam, strongly sloping (Ro).—This soil is on slopes of 9 to 15 percent. It is otherwise like the other phases of Riverside fine sandy loam and is used in the same way, except that it remains in hay or pasture crops more of the time.

Riverside loam, level (Rt).—This mapping unit occurs on slopes of less than 2 percent. The subsoil is light loam to sandy loam. The moisture-holding capacity is moderately high to low. This soil is less droughty and somewhat more productive than other soils of the Riverside series. Nearly all areas are irrigated and cultivated. They are used for a wide range of crops, including alfalfa, small grains, seed peas, truck crops, small fruits, and irrigated pasture.

Riverside loam, gently sloping (Ru).—This soil occurs on slopes of 2 to 5 percent. Otherwise, it is similar to Riverside loam, level, and it is used in the same way as that phase.

Riverside loam, sloping (Rv).—This soil is similar to the other phases of Riverside loam, except that it is on slopes of 5 to 9 percent. It is used for the same crops, but more of it is kept in hay and pasture. Nonirrigated areas are in native range.

Riverside loam, strongly sloping (Rw).—This soil is like the other phases of Riverside loam, except that it is on slopes of 9 to 15 percent. It is somewhat shallower to gravel, and cobblestones and gravel are scattered on the surface in many places. The soil is used chiefly for native range or irrigated pasture.

Riverside cobbly loam, gently sloping (Rg).—This soil occurs on slopes of less than 5 percent, chiefly around the edges of old high benches. Although cobbly, it can be cultivated. Most areas are irrigated. They are used to some extent for most of the crops commonly grown in the valley. Most of the time they are left in alfalfa, mixed grass-and-legume hay, or perennial pasture. Nonirrigated areas are used for range.

Riverside cobbly loam, sloping (Rh).—This soil is like Riverside cobbly loam, gently sloping, except that it is on slopes of 5 to 9 percent. It is used in the same way as the gently sloping phase.

Riverside soils, moderately steep and steep (Rx).—This is an undifferentiated group of soils that occur on gravelly bench edges. Slopes are steeper than 15 percent. The soils range from deep loose gravels to gravel-mantled loamy material on the edge of benches. Most of them are gravelly and cobbly sandy loam or loamy sand. Also included in the mapping unit are bench-edge areas of the Lolo, Grantsdale, Lone Rock, Dominic, Greeley, Breece, and Adel series. The areas are too steep and too gravelly or cobbly to be cultivated. They are mostly in native range. A few irrigated areas are mostly in bluegrass.

Riverwash

Riverwash (Ry).—This unit is composed of recently deposited sand and gravel on bars and flats next to channels of the Bitterroot River. When the river is at its normal level, the areas lie only a few feet above the river. They are flooded in spring. Their boundaries may shift annually as the stream cuts away or deposits more material. The areas are barren of vegetation or are scantily covered by young cottonwood and willow shrubs and annual weeds. They have little value for agriculture.

St. Joe Series

The St. Joe soils are shallow, wet, meadow soils of the low fans and terraces on the west side of the valley. They are associated with the Larry and Victor soils. They have developed in noncalcareous alluvial fine earth less than 20 inches deep over gravel of granitic origin. Drainage is restricted. The dominant native vegetation is sedges and moisture-loving grasses. Scattered willows and other shrubs may grow along the drainageways.

The St. Joe soils have thin surface mats of peat or muck; moderately thick, very dark gray or black, friable surface soils; moderately thick, dark gray to very dark gray, mottled loam to gravelly loam subsoils; and substrata of sand and gravel beginning less than 20 inches from the surface. These soils are shallow and imperfectly to poorly drained. Their subsoils are moderately rapidly permeable, and their substrata are very rapidly permeable. They have low moisture-supplying capacity and moderately high natural fertility.

The St. Joe soils are intermediate between the Larry and the Poverty soils, but are more like the Larry soils.

They are like the shallow phases of the Victor soils but are poorly drained.

Profile of St. Joe loam:

A_0 2 to 0 inches, organic mat, mostly roots.

A_1 0 to 9 inches, gray (dry) to black (moist) friable loam; weak medium granular structure; neutral reaction; clear boundary between this and horizon below.

B 9 to 15 inches, light-gray (dry) to grayish-brown with numerous distinct mottles of browns and grays (moist) gravelly loam; friable; slightly acid; clear boundary with layer below.

C 15 to 24 inches, mottled and stained loose sand and gravel.

The surface soil when moist ranges from very dark gray to black. It is 6 to 12 inches thick. The depth to sand and gravel varies somewhat but is generally not more than 20 inches. Drainage is poor to moderately good.

St. Joe loam and clay loam, level (Sa).—This mapping unit occurs on concave and smooth slopes of 0 to 2 percent. Many areas are actually poorly defined drainageways. The surface layer is loam, clay loam, or a complex of the two. The loam texture predominates. The soils are generally too wet to cultivate. However, they are likely to become dry toward fall unless irrigated. The areas are used for pasture or for wild hay. The marshy spots are practically wasteland.

St. Joe loam and clay loam, gently sloping (Sb).—This mapping unit occurs on slopes of 2 to 5 percent. Otherwise it is like St. Joe loam and clay loam, level, and is used in the same way.

St. Joe loam and clay loam, sloping (Sc).—This mapping unit is like the other phases of St. Joe loam and clay loam, except that it is on slopes of 5 to 9 percent. It is used in the same way as the other phases.

St. Joe loam and clay loam, drained, level (Sd).—This mapping unit is like St. Joe loam and clay loam, level, except that it has been artificially drained by open ditches until the soils have become dry enough to cultivate. Drainage varies from imperfect to moderately good. Most of the areas are cultivated to small grains and mixed grass-and-clover hay. Careful management is required to maintain a balance between drainage and irrigation.

St. Joe loam and clay loam, drained, gently sloping (Se).—This unit is like St. Joe loam and clay loam, drained, level, except that it is on slopes of 2 to 5 percent. It is used in the same way as the level phase.

Shook Series

In the Shook series are very dark colored, moderately sandy, upland soils of fairly low natural fertility. They occur in the dryland sections on the east side, at elevations above 4,000 feet, and in Sula Basin and French Basin. These soils have developed under grass. Rainfall is moderately high. The parent material is weathered granitic material that is moderately deep to deep over granite bedrock.

The associated soils are principally mapping units of the Brownlee-Duffy-Ravalli complex. Shook soils differ from these chiefly in having noncalcareous friable sandy loam subsoils that are fairly uniform throughout an area. Apparently the difference is caused by a much lower proportion of sedimentary fine earth in the parent material.

The Shook soils have moderately thick, very dark grayish-brown to black, very friable sandy loam surface soils; moderately thick to thick, dark-brown, very friable coarse sandy loam subsoils; and brown, very friable to loose, gravelly coarse sandy loam substrata which grade into partly weathered granite at depths of 24 to 42 inches. The soils are moderately deep to deep, moderately rapidly permeable, and well drained. They have low to moderately high moisture-supplying capacity and low to moderately high natural fertility. Because the individual particles are easily loosened, the soils are highly erosive.

The Shook soils are like the Brownlee and Duffy soils, but more sandy and somewhat less strongly developed. They are much deeper over bedrock and have much better developed profiles than the Stecum soils. Except that they developed from bedrock, they are like the Blodgett soils, which have developed in granitic outwash on the west-side high benches.

The Shook soils show only moderate development. Profile of Shook coarse sandy loam:

A_1 0 to 8 inches, very dark grayish-brown (dry) to black (moist) coarse sandy loam; weak coarse and medium granular structure; slightly hard (dry) to very friable (moist); slightly acid; lower boundary clear and smooth.

B_2 8 to 16 inches, brown (dry) to dark-brown (moist) coarse sandy loam; weak to moderate medium and coarse blocky structure; little or no more clay than in the A_1 horizon; hard (dry) to friable (moist) or slightly sticky (wet); slightly acid; lower boundary gradual and smooth.

B_3 16 to 28 inches, brown (dry) to dark-brown (moist) coarse sandy loam, a shade lighter than the B_2 horizon; weak coarse subangular blocky structure; abundant subangular granite fragments the size of fine gravel; slightly hard (dry) to friable (moist) or slightly sticky (wet); slightly acid; lower boundary gradual and smooth.

C 28 to 40 inches, brown (dry and moist) coarse sandy loam; 50 percent or more granitic fragments of the size of fine gravel; loose (dry and moist); slightly acid.

The depth to relatively unweathered bedrock ranges from 30 to 50 inches.

Shook coarse sandy loam, sloping (Sf).—This mapping unit occurs on gently rounded ridges and bedrock slopes of 5 to 9 percent. A few areas have been eroded. None of this soil is irrigated. Many areas have been plowed and cultivated, chiefly for small grains grown in an alternate crop and fallow system. Most areas are being returned to crested wheatgrass or other perennial grasses. Areas in native sod are used for range.

Shook coarse sandy loam, strongly sloping (Sg).—This soil is like Shook coarse sandy loam, sloping, but it is on slopes of 9 to 15 percent. It is used in the same way as the sloping phase.

Shook coarse sandy loam, moderately steep (Sh).—This soil occurs on sharply rounded ridges and on the walls of coulees. Slopes range from 15 to 25 percent. It is somewhat shallower to bedrock than the other phases of Shook coarse sandy loam. It is almost entirely in native sod and is used for grazing.

Skaggs Series

The Skaggs soils developed high on the east side of the valley along the foot of the Sapphire Mountains. The parent materials consist partly of weathered limestone and partly of silts deposited by wind. The soils have developed under grass. The normal annual precipitation is 17 to 20 inches, and the growing season is fairly short.

The Skaggs soils have moderately thick, black silt loam surface soils; moderately thick, brown, friable silt loam subsoils; and substrata of pale-yellow silt loam mixed with weathered limestone fragments. Partly weathered to hard limestone begins at 24 to 48 inches. The soils are deep, moderately permeable, and well drained. They have high moisture-supplying capacity and high natural fertility. They contain so much silt that they are easily eroded.

The Skaggs soils are decidedly darker colored, but they are otherwise similar to the Maiden soils of the Maiden-Gird complex. They have much thicker sections of permeable silty material over the bedrock and better developed profiles than the Sogn soils. They differ from the Teton soils in being over limestone rather than sandstone.

The Skaggs soils are moderately well developed. Profile of Skaggs silt loam:

A_p 0 to 8 inches, very dark grayish-brown (dry) to black (moist) friable silt loam; moderate fine crumb structure; about neutral reaction; clear lower boundary.

B_2 8 to 15 inches, light yellowish-brown (dry) to brown (moist) friable silt loam; moderate medium subangular blocky structure; noncalcareous except for a few limestone chips; clear lower boundary.

B_{3ca} 15 to 20 inches, pale-yellow (dry) to light yellowish-brown (moist) friable silt loam; very weak medium subangular blocky structure; strongly calcareous; gradual transition to C_{ca} horizon.

C_{ca} 20 to 32 inches, white (dry) to pale-yellow (moist) friable silt loam; contains weathered limestone fragments; strongly calcareous; merges with C horizon.

C 32 to 48 inches, weathered limestone of silt loam texture; contains many limestone fragments; white with large yellow splotches in the upper part; strongly calcareous.

The depth of the profile over bedrock varies. In some places, the surface soil is very dark brown rather than black.

Skaggs silt loam, sloping (Sk).—This soil occurs on upland slopes of 5 to 9 percent. It is nearly all dryland cultivated. Small grains, grown under an alternate crop and fallow system, are the principal crops. Some areas are being reseeded to perennial grasses. Because of the relatively high rainfall and high natural fertility, this is one of the most productive dryland soils in the Bitterroot Valley Area. Areas in native sod are used for grazing.

Skaggs silt loam, strongly sloping (Sl).—This soil occurs on upland slopes of 9 to 15 percent. It is used in the same way as Skaggs silt loam, sloping, but is much more likely to erode when fallow. Some areas are already moderately eroded.

Skaggs silt loam, moderately steep (Sm).—This soil is on slopes of 15 to 25 percent. It is too steep to be suitable for cultivation. It is mostly in native sod and used for grazing.

Skaggs silt loam, steep (Sn).—This soil occurs on slopes steeper than 25 percent. It is too steep to be cultivated. It is left in native range and used for grazing.

Skaggs-Sogn Association, Mountainous

Profile characteristics for the Skaggs soil are given in the separate description of the Skaggs series. The Sogn soil is described under the Sogn-Skaggs complex.

Skaggs-Sogn association, mountainous (So).—This association consists of mountainous grassland areas underlain by pre-Cambrian limestones. Most slopes are more than 25 percent. Soils in these areas are chiefly Skaggs silt loam and Sogn stony loam. Some rock outcrops occur. The association lies chiefly on the lower slopes of the Sapphire Mountains, but it extends to higher elevations on south-facing slopes. The principal use is for grazing livestock and wild game.

Skalkaho Series

The Skalkaho soils developed in gravelly and cobbly old alluvium on high benches. There is enough fine earth in the surface soil and subsoil to make them fairly coherent, but the substrata are loose sand and gravel. The coarse fragments are mostly quartzite and argillite, but some are granite. These soils developed under grass. The normal annual precipitation is between 15 and 18 inches.

Skalkaho soils have moderately thick, very dark grayish-brown gravelly loam surface soils; moderately thick, dark grayish-brown, very friable gravelly loam subsoils; and substrata of loose sand and gravel. They are shallow and somewhat excessively drained. Their subsoils are moderately rapidly permeable, and their substrata are rapidly permeable. They have low moisture-supplying capacity and low to moderately high natural fertility.

Skalkaho gravelly loam, gently sloping (Sp).—This soil occurs on smooth to convex bench remnants. Slopes range from 2 to 5 percent. Most of the areas are west of Victor. Where irrigated, this soil is used chiefly for small grains, mixed grass-legume hay, and pasture. Some areas where the water supply is inadequate were once in apple orchards but have been abandoned to weeds. Droughtiness is the limiting factor in the use of this soil.

Skalkaho gravelly loam, sloping (Ss).—This soil occurs on smooth to convex slopes of 5 to 9 percent. It is in the same general areas as Skalkaho gravelly loam, gently sloping, and is used similarly.

Skalkaho gravelly loam, strongly sloping (Su).—This soil occurs west of Victor on dissected bench slopes of 9 to 15 percent gradient. It is so steep that it is used chiefly for pasture. Some areas that have plenty of water are cultivated to a limited extent.

Skalkaho gravelly loam, moderately steep (Sw).—This soil occupies bench edges west of Victor. Slopes range

from 15 to 25 percent. The soil is too steep to cultivate. It is used for pasture, usually without irrigation.

Skalkaho Series, Micaceous Variant

The micaceous variants of the Skalkaho series occupy high benches and fans on the west side of the Bitterroot Valley in Missoula County. The parent materials are chiefly weathered micaceous gravels washed from areas of gneiss and schist in the Bitterroot Mountains to the west. These soils developed under grass. The normal annual precipitation is 14 to 16 inches.

These soils have moderately thick to thick, very dark grayish-brown gravelly coarse sandy loam surface soils; moderately thick, grayish-brown, friable gravelly sandy loam subsoils; and substrata of micaceous sand and gravel that contain some fine earth. All horizons have a greasy feel because of the high content of weathered mica and related minerals. The soils are shallow to moderately deep. They are well to somewhat excessively drained. Their subsoils are moderately rapidly permeable, and their substrata are rapidly permeable. They have low to moderately high moisture-supplying capacity and moderately high natural fertility.

The micaceous variants differ from the typical Skalkaho soils chiefly in the type of rocks in the parent materials. They are somewhat less droughty and a little more productive.

Skalkaho gravelly coarse sandy loam, micaceous variant, gently sloping (Sr).—This soil occurs on slopes of 2 to 5 percent. It is used for general farming. It is used principally for small grains and pasture. Some seed peas and truck crops are grown.

Skalkaho gravelly coarse sandy loam, micaceous variant, sloping (St).—This soil is like the gently sloping phase, except that it is on slopes of 5 to 9 percent. The two phases are used in the same way.

Skalkaho gravelly coarse sandy loam, micaceous variant, strongly sloping (Sv).—This soil occurs on slopes of 9 to 15 percent. When irrigated, it is used chiefly for mixed grass-legume hays and pasture. Some small grains are grown. Nonirrigated areas are in native sod and are used for grazing.

Skalkaho gravelly coarse sandy loam, micaceous variant, moderately steep (Sx).—This soil occurs on bench edges and steep fan slopes at the foot of the mountains. Slopes are from 15 to 25 percent. This soil is too steep to be cultivated and is used for grazing. Some areas may be irrigated with waste water.

Skalkaho-Ravalli Complex

The Skalkaho-Ravalli complex occurs on the east side of the valley, on parts of Tertiary benches that are irregularly mantled with gravelly and cobbly old alluvium. About 50 percent of the complex consists of the Skalkaho soils, which occur where the mantle is 24 or more inches thick. The Ravalli occur where it is only a few inches thick or missing; they make up about 30 percent of the complex. The rest consists of an unnamed soil which is something like the Burnt Fork series but darker, and which has developed where the mantle is of intermediate thickness. The soils are too intricately associated to be shown separately, even on detailed soil maps. All of these soils developed under grass. The normal annual precipitation is 14 to 18 inches, and the growing season is of medium length.

Most of the Skalkaho soils in this complex have more fine earth in their profiles and are more coherent than the Skalkaho soils mapped separately west of Victor. However, where the mantle of alluvium is thicker than 36 inches, the substrata are loose sand and gravel. The surface soils are moderately thick, very dark grayish-brown to black, friable loams to stony loams; the subsoils are moderately thick, dark grayish-brown, friable gravelly loams; and the substrata are argillite and quartzite gravels above loamy Tertiary formations which lie at depths of 24 to 60 inches.

The Ravalli soils in the complex have moderately thick, very dark grayish-brown, friable loam surface soils; moderately thick, dark-brown clay loam subsoils of columnar structure; and pale-brown loamy substrata that have many areas of lime and gypsum concentration in the upper part. These areas are slowly permeable and difficult to manage. It is very hard to get good stands of crops in some years.

The unnamed soil that resembles the Burnt Fork series has moderately thick, very dark brown to black, friable loam surface soils; moderately thick, very dark grayish-brown, friable loam subsoils; and highly calcareous, permeable, loamy substrata.

All of the soils have scattered to numerous pebbles, cobblestones, or larger stones on the surface. The depths vary from shallow to deep. The rate of permeability ranges from moderately rapid to very slow, and the moisture-holding capacity ranges from moderately high to high. Except in the slick spots, natural fertility is high.

Skalkaho-Ravalli loams, gently sloping (Sy).—This mapping unit occurs on bench slopes of 2 to 5 percent. Although not stony enough to be classed as cobbly, the surface soil contains enough gravel and cobblestones to interfere with tillage. Almost all areas are above the irrigation canals. Most of them have been plowed at some time and used for small grains on an alternate crop and fallow basis. However, nearly all areas have been reseeded to perennial grasses and are being used for range. Areas in native sod are also used for range. The few irrigated areas are used in the same way as the gently sloping Burnt Fork-Ravalli loams.

Skalkaho-Ravalli loams, sloping (Sz).—This mapping unit is like Skalkaho-Ravalli loam, gently sloping, except that it is on bench slopes of 5 to 9 percent. It is used in the same way as the gently sloping phase.

Skalkaho-Ravalli loams, strongly sloping (S2a).—This mapping unit differs from the other phases of Skalkaho-Ravalli loams primarily in slope, which ranges from 9 to 15 percent. Some areas have been cultivated, but these have nearly all been reseeded to grass and are now used for grazing.

Skalkaho-Ravalli loams, moderately steep (S2b).—This mapping unit occurs on bench-edge slopes of 15

to 25 percent gradient. The soil is somewhat shallower and contains more cobblestones than the other phases of Skalkaho-Ravalli loams. It is in native sod and is used for grazing.

Skalkaho-Ravalli stony loams, sloping and strongly sloping (S2c).—This mapping unit occurs on bench slopes of 5 to 15 percent gradient. The surface layers are too stony to be cultivated. All areas are in native sod and used for range (fig. 11).

Skalkaho-Ravalli stony loams, moderately steep and steep (S2d).—This mapping unit occurs on bench edges. Slopes are steeper than 15 percent. The surface soils are stony. All areas are in native sod and used for range.

Slocum Series

The Slocum soils are imperfectly drained to moderately well drained alluvial soils that are developing in sandy fine earth overlying gravel. The normal phases are 20 to 36 inches deep over gravel but both shallow and deep phases are also mapped. These soils are associated with the Chamokane soils on the flood plains of the Bitterroot River and some of the major side creeks. The native vegetation is dominantly grass but includes a scattering of cottonwood, willow, other brush, and ponderosa pine. The parent material is mixed alluvium derived from granite, quartzite, and argillite.

The Slocum soils have moderately thick, very dark gray, friable surface soils; moderately thick, dark grayish-brown, mottled, very friable loam or sandy loam subsoils; and substrata of noncalcareous sand and gravel beginning at depths ranging from 12 to 48 inches.

The Slocum soils are like the Chamokane soils but are less well drained. They were derived from sandier material than the Corvallis soils, are less calcareous, and occur on flood plains rather than on alluvial fans. They are neither so dark nor so poorly drained as the Gallatin soils and were derived from coarser materials.

Except for color, the Slocum soils do not show much soil profile development. Profile of Slocum loam:

1. 0 to 8 inches, grayish-brown (dry) to very dark gray (moist) loam; coarse granular or crumb structure; slightly acid; clear lower boundary.

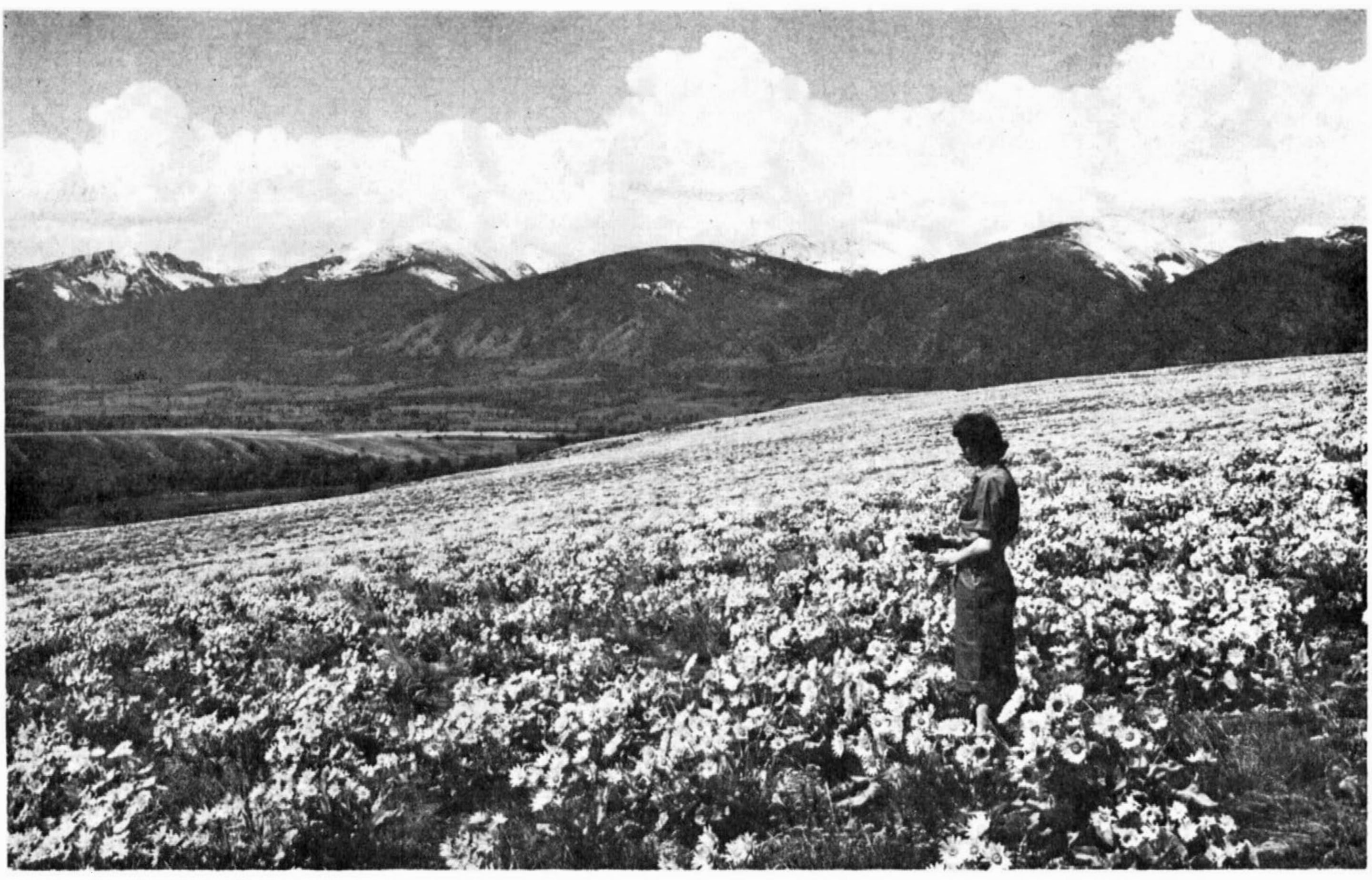

Figure 11.—Skalkaho-Ravalli stony loams, sloping and strongly sloping. The dominant cover of balsamroot (*Balsamorhiza sagittata*) indicates poor range condition. Soil along Woodchuck Creek in the left foreground is Lolo cobbly loam, gently sloping. Beyond is the Chamokane-Slocum association on flood plains and low terraces of the Bitterroot Valley floor. The Blodgett-Bass association on high benches and the Como-Woodside association on high benches and moraines lie at the foot of the Bitterroot Mountains. Photo by Ernst Peterson.

2. 8 to 18 inches, light brownish-gray (dry) to grayish-brown (moist) loam grading to sandy loam in the lower part; faintly to moderately mottled and streaked with shades of brown and yellowish brown; neutral reaction; gradual transition to next horizon.
3. 18 to 24 inches, light-gray (dry) to light brownish-gray (moist) loose loamy sand; some brown stains and mottles; neutral reaction.
4. 24 to 40 inches, loose gray sand and gravel.

There is considerable variation in the number and size of coarse fragments in the upper part of the profile and in the depth to loose gravel. Some areas are gravelly or cobbly. Where the underground water moves relatively rapidly, little or no mottling occurs in the subsoil. Phases are separated according to depth, drainage, and salinity instead of by slope.

Slocum loam (S2g).—This is the unit most nearly typical of the Slocum series. It is moderately deep and moderately well drained. The subsoils are moderately rapidly permeable, and the substrata are rapidly permeable. Both moisture-supplying capacity and natural fertility are moderately high. Most areas are subirrigated to some extent but are dry enough to be cultivated.

Use of this soil varies considerably. In the Chamokane-Slocum association, much of it is in native hay or pasture. Part of it is farmed in regular rotations of small grains, mixed grass-legume hays, and sometimes alfalfa or red clover. In the Corvallis area, agriculture is more intensive, and sugar beets may be included in the rotation. Along the side creeks, areas that are large enough are regularly farmed to small grains, sugar beets, and hay. Small patches mixed with nontillable soils are normally used for pasture. Few areas are large enough to be managed as separate fields. Usually the suitabilities of the associated soils will determine the use to which this soil will be put.

Slocum loam, deep (S2h).—This soil is more than 36 inches deep over gravel. It has a thicker darker colored topsoil than is typical of the Slocum series, and is slightly better drained. It is deep, moderately rapidly permeable, and moderately well drained. It has moderately high to high moisture-supplying capacity and high natural fertility. Most areas are on the large "islands" between channels between Victor and Bell Crossing. It is difficult to maintain diversions of water from the river for irrigation. In spring of some years, the water table may be temporarily too high to permit cultivation. However, most areas are cultivated. The principal crops are small grains, alfalfa, and mixed grass-legume hay.

Slocum loam, slightly saline (S2k).—This soil occurs mostly on the east side. Part of it is in the Hamilton-Corvallis-Grantsdale soil association, and part is in the Chamokane-Slocum soil association. It is like Slocum loam, except that the soil contains enough salts to affect crops slightly. Where adequate drainage can be established, it should be possible to leach the excess salts rather easily. Most of this soil is cultivated. It is used for small grains, mixed grass-legume hay, and sugar beets. Some areas are in pasture. It is hard to get a stand established, but, once started, most crops do relatively well.

Slocum loam, poorly drained variant (S2l).—This soil is saturated most of the year. It generally has a 2- to 4-inch mat of organic matter on the surface. The subsoil may be neutral gray rather than mottled. This soil is nonsaline and moderately deep. It has moderately high to high natural fertility. It is used for wild hay and for pasture. Some spots are too wet to be of much value.

Slocum sandy loam-gravelly sandy loam, shallow (S2m).—This mapping unit is less than 20 inches thick over gravel and includes scattered, very shallow, gravelly spots. Drainage is moderately good to imperfect. The soils are mostly in swales, in association with various Chamokane soils. These soils vary so much in drainage that it is hard to keep moisture conditions right for all the soils in a field. Many areas are used for pasture. Those cultivated are used mostly for small grains and mixed hays.

Slocum complex, shallow, slightly saline (S2e).—This complex consists of intricately associated areas of sandy loam, gravelly sandy loam, and cobbly sandy loam. The soils are rather open from the surface downward. They are underlain by loose sand and gravel at less than 20 inches. Drainage is imperfect. Most areas are seeped during most of the year. Some spots are strongly saline. The areas are generally level. The overall slope is less than 2 percent, but there are many small irregularities. Most of the areas are in grass and are used for grazing. They respond very poorly to cultivation. The salts could probably be leached out rather easily if deep drainage were established, but the soils would then be too droughty to be very productive. Drainage would be difficult in most places because the substrata are generally porous and because the water table is continuous under all of the Bitterroot River flood plains.

Slocum complex, shallow, moderately saline (S2f).—Many spots in this mapping unit are strongly saline. Most of the areas are in grass and are used for pasture, but many spots are barren. White salt crusts are common.

Slocum-shallow muck complex (S2n).—This is an association of marshes, old channelways, and poorly drained soils of various depths over gravel. The wetter soils of the Slocum series predominate. Some Gallatin soils, Peat soils, and gravel bars are included. The areas are mostly on the flood plains of the Bitterroot River. They are too rough to cultivate and are used only for pasture.

Sogn-Skaggs Complex

This complex occurs high on the east side of the valley, just below the Sapphire Mountains, in areas underlain by limestone. It occurs on relatively smooth topography. Small rock outcrops are scattered among areas of shallow and moderately deep black soils. The rock outcrops and the shallow soils represent the Sogn series. Where the Sogn soils are best developed, they are underlain by weathered, pale-yellow limestone within 8 or 10 inches of the surface. The moderately deep areas are Skaggs soils, which are described under the Skaggs series.

The Sogn-Skaggs complex is shallow to moderately deep, moderately permeable, and well drained. It has moderately high moisture-supplying capacity and high natural fertility. It occurs in areas where the growing season is fairly short and the normal annual precipitation is 18 inches or more.

Sogn-Skaggs loams and stony loams, strongly sloping (S2o).—This mapping unit occurs on slopes of 9 to 15 percent. The surface layers are usually stony around the rock outcrops. Most areas were plowed and cultivated during the early days of settlement. Practically all have since reverted to native sod or have been reseeded to crested wheatgrass or other grasses. They are now used for range.

Sogn-Skaggs loams and stony loams, moderately steep (S2p).—This mapping unit occurs on slopes of 15 to 25 percent. Otherwise it is like Sogn-Skaggs loams and stony loams, strongly sloping, and it has had a similar history of use.

Stecum Series

The Stecum soils are shallow to moderately deep, sandy, and noncalcareous. They developed in weathered materials derived from granite and gneiss bedrock. They are associated with the Brownlee and Shook soils on foothills and mountains. During the time the soils were developing, the vegetation was grass and scattered stands of pine. The normal annual precipitation is 13 to 19 inches.

The Stecum soils have thin to moderately thick, very dark grayish-brown surface soils, and thin to moderately thick, very friable, loamy coarse sand subsoils. The substrata are weathered granite that merges into hard granite bedrock. Rock outcrops are numerous. The soils are shallow, rapidly permeable, and somewhat excessively drained. They have low moisture-supplying capacity and low natural fertility.

The Stecum soils are much less well developed than the Shook and Brownlee soils. They have less clay in their subsurface horizons and they lack the brown strongly developed B_2 horizons.

Profile of Stecum coarse sandy loam at nearly maximum development.

A_1 0 to 5 inches, light brownish-gray (dry) to very dark grayish-brown (moist) coarse sandy loam; weak coarse granular and weak fine subangular blocky structure; slightly hard (dry) to very friable (moist); contains fairly abundant grass roots; neutral to slightly acid; clear smooth lower boundary.

BC 5 to 12 inches, pale-brown (dry) to brown (moist) loamy coarse sand; weak coarse crumb and weak fine subangular blocky structure; slightly hard (dry) to very friable (moist); contains a few fine plant roots and fine threadlike pores; about neutral; clear wavy lower boundary.

C 12 to 28 inches, light-gray (dry) to pale-brown (moist) coarse sand mixed with about an equal amount of angular granitic fragments, mostly the size of fine gravel; abundant fine mica flakes; porous massive structure; dries slightly hard in exposed cuts; contains few or no plant roots except a few tree roots around the occasional pine or small clumps of pine that occur in places; neutral to slightly alkaline.

D_r 28 inches +, fragmented and partly weathered micaceous light-colored (gray) granite and gneiss.

The texture of the surface soil varies from light coarse sandy loam to coarse loamy sand. The depth to relatively unweathered bedrock ranges from 1 to 5 feet. Where the soils are shallowest, the brown color that shows the beginning of a B horizon development may be lacking. Numerous small to large rock outcrops extend one to several feet above the surface.

Stecum coarse sandy loam, gently sloping (S2r).—This soil occurs on slopes of less than 5 percent. A few areas that are below the Bitterroot Valley Irrigation District ditch are irrigated. They are used for improved pastures, mixed legume-grass hays, and small grains. Yields, especially of small grains, are relatively low. Nonirrigated areas are in native sod and are used for grazing.

Stecum coarse sandy loam, sloping (S2s).—Except that it occurs on slopes of 5 to 9 percent, this soil is like Stecum coarse sandy loam, gently sloping. The two soils are used similarly.

Stecum coarse sandy loam, strongly sloping (S2t).—This mapping unit occurs on slopes of 9 to 15 percent. Otherwise it is similar to Stecum coarse sandy loam, sloping. Nearly all areas are in native range.

Stecum stony loamy coarse sand, sloping (S2u).—This soil occurs on slopes of 5 to 9 percent. It has many large and small rock outcrops, which are rounded and smooth from weathering and wind scouring. In the spaces between the rocks are loamy coarse sand or coarse sandy loam soils, usually somewhat less well developed than the typical soil of the series. In the hills on either side of Willow Creek east of Corvallis, where the dominant vegetation is open pine, areas of Woodrock soils are included. This mapping unit is used for grazing. Some of the pines are harvested for timber.

Stecum stony loamy coarse sand, strongly sloping (S2v).—This soil is like Stecum stony loamy coarse sand, sloping, except that it occurs on slopes of 9 to 15 percent. It is used in the same way as the sloping phase.

Stecum stony loamy coarse sand, moderately steep and steep (S2w).—This mapping unit is like the other phases of Stecum stony loamy coarse sand except that it is on slopes steeper than 15 percent. Many of the slopes are broken. This soil is used for grazing.

Sula Series

The Sula are noncalcareous silty dark soils of the west-side benches. Their parent materials are wind-deposited silts 18 inches to several feet thick over weathered brown gritty loam derived from granitic outwash. During the time the soils were developing, the vegetation was grass and scattered conifers. The normal annual precipitation is 15 to 18 inches, and the growing season is relatively short.

The Sula soils have moderately thick, very dark grayish-brown, friable silt loam surface soils, and moderately thick, yellowish-brown, friable silt loam subsoils. Their light yellowish-brown silt loam substrata are underlain by brown gritty loam at depths below 18 inches. These soils are deep, moderately permeable, and well drained. They have high moisture-

Figure 12.—Wheat grown under irrigation on Sula silt loam, gently sloping, in a rotation of small grains and mixed grass-clover hay. Phosphate and manure have been applied regularly. Trapper Peak in the background. Photo by Ernst Peterson.

supplying capacity and high natural fertility. They are stone-free. They have a uniformly silty texture and are consequently easily eroded when fallow.

The Sula series has darker colored, less acid surface soils than the Gorus series. The substrata are less calcareous than those of the Gird soils. The Sula soils are more silty and have less strongly developed horizons than the Charlos soils.

Profile of Sula silt loam:

A_1 0 to 8 inches, grayish-brown (dry) to very dark grayish-brown (moist) friable silt loam; weak medium platy structure; slightly acid; merges with B_2 horizon.

B_2 8 to 12 inches, light brownish-gray (dry) to dark grayish-brown (moist) friable silt loam; weak medium subangular blocky structure; slightly acid; merges with C horizon.

C 12 to 22 inches, light yellowish-brown (dry) to yellowish-brown (moist) friable silt loam; very weak medium to fine subangular blocky structure; neutral reaction; abrupt lower boundary.

B_{2b} 22 to 31 inches, brown (dry) to dark-brown (moist) firm gritty light clay loam; weak subangular structure; gradual transition to B_{3b} horizon.

B_{3b} 31 to 45 inches, reddish-yellow (both dry and moist) friable gritty loam; contains a few white lime spots.

The silt layers are typically from 18 to 42 inches thick, but may be as much as several feet thick. Other characteristics of the soils are fairly uniform.

Sula silt loam, level (S3a).—This soil occurs on bench slopes of less than 2 percent gradient. Nearly all of it is cultivated for mixed legume-grass hays, improved pastures, and small grains. Some, but not all, of the areas are irrigated. Areas in native sod are used for grazing.

Sula silt loam, gently sloping (S3b).—This soil is like Sula silt loam, level, except that it is on bench slopes of 2 to 5 percent. It is used in the same way as the level phase (fig. 12).

Sula silt loam, sloping (S3c).—This mapping unit occurs on bench slopes of 5 to 9 percent. Otherwise it is like the other phases of Sula silt loam, and is used in the same way.

Sula silt loam, strongly sloping (S3d).—This soil is like the other phases of Sula silt loam, except that it is on slopes of 9 to 15 percent. Cultivated areas are used chiefly for improved pastures and mixed grass-legume hays. These areas are occasionally plowed and planted to small grains, in preparation for reseeding pasture or hay. Areas in native sod are used for grazing.

Sula Variant-Ravalli Complex

This complex occurs only in French Basin, on irregularly dissected Tertiary benches that are mantled with more or less gritty silty fine earth. Part of this material was probably deposited by wind and part was derived from the weathering of the Tertiary deposits. About 60 percent of the area is a variant of Sula loam and about 40 percent is Ravalli loam. They are intricately associated. The Sula loam variant is like the Sula series, except that grit is mixed with the silts. The Ravalli loam of these complexes is like that described in the Burnt Fork-Ravalli complex.

The Sula soil is deep, moderately permeable, and well drained. It has high moisture-supplying capacity and high natural fertility. Ravalli loam is deep and well drained, but it has very slowly permeable subsoils and moderately permeable substrata. It has high moisture-supplying capacity and moderately high natural fertility.

Sula loam variant-Ravalli loam, gently sloping and sloping (S2x).—This mapping unit occurs on slopes of 2 to 9 percent. It is nearly all in native sod and used for range. A few of the most gently sloping areas are irrigated and used for alfalfa and small-grain hays. The growing season is too short for small grains to mature in most years.

Sula loam variant-Ravalli loam, strongly sloping (S2y).—This mapping unit occurs on slopes of 9 to 15 percent. It is all in native sod and used for grazing.

Sula loam variant-Ravalli loam, moderately steep and steep (S2z).—This mapping unit occurs on slopes steeper than 15 percent. It is all in native range.

Sula-Haccke Complex

The Sula soils occupy about 80 percent of the areas of the Sula-Haccke complex. The remainder consists of spots of Haccke soils intricately associated with the Sula soils. This complex is managed in the same way as the Sula series, but it is a little more difficult to manage and somewhat lower in productivity.

Profile characteristics of the Sula soil are described under the Sula series. The Haccke soil in this complex is like that described under the Gird-Haccke complex.

Sula-Haccke silt loams, sloping (S3e).—This mapping unit occurs on slopes of 5 to 9 percent. It is used in the same way as Sula silt loam, level.

Sula-Haccke silt loams, strongly sloping (S3f).—This mapping unit is on slopes of 9 to 15 percent. It is used in the same way as Sula silt loam, strongly sloping.

Teton-Cheadle Association, Mountainous

Teton-Cheadle association, mountainous (Ta).—This association includes all of the mountainous grassland areas underlain by quartzite, argillite, and sandstone of the pre-Cambrian Belt formation. Most of the areas are long smooth mountainsides of more than 25 percent gradient. Some ridges, rock outcrops, and canyon walls are included. The dominant soils are moderately deep to deep stony loams of the Teton series, and shallow and very shallow dark-colored Cheadle soils. The areas, as a whole, are moderately deep. The normal annual rainfall is more than 16 inches. Grazing is the principal use.

Trapper Association, Mountainous

This association is mapped in timbered mountainous areas underlain by limestone. It occurs at elevations above 5,000 feet in the Sapphire Mountains east of Corvallis. The slopes are rolling, hilly, or steep. Trapper soils are predominant; the soils associated with them have not been named.

The Trapper soils developed mostly from metamorphosed pre-Cambrian dolomitic limestones of the Belt series. Slope creep and colluvial action added materials from higher lying siliceous rocks and deposited coarse fragments on the surface and in the profile.

These deep soils have dark-colored, medium-textured B_2 horizons, and distinct horizons of calcium carbonate accumulation. The parent materials of the soils in this association are the same as those of the Skaggs and Maiden soils, which occur at lower elevations in the same general area. A typical soil profile of Trapper stony loam follows:

A_0 and A_1 1 to 0 inches, dark-gray (dry) to black (moist) layer, including a loamy, partly decomposed organic mat and a thin (¼ inch or less) A_1 horizon; contains abundant fine plant roots; neutral reaction.

A_2 0 to 6 inches, light-gray (dry) to grayish-brown (moist) stony loam; coarse fragments, principally subangular blocks and chips of sandstone, quartzite, and argillite; structure massive in places but breaks easily to weak fine crumbs; soft (dry) to very friable (moist); contains numerous small pores and capillary tubes; large and small roots abundant; neutral reaction.

A_3 6 to 8 inches, pale-brown (dry) to brown (moist) stony heavy loam; layer is transitional to B_{21} horizon; clear wavy lower boundary.

B_{21} 8 to 16 inches, yellowish-brown (dry) to strong-brown (moist) stony clay loam and light clay loam; moderate medium blocky to subangular blocky structure; dark-brown coatings on some of the blocks; slightly hard (dry) to friable (moist) or slightly sticky (wet); contains abundant tree roots but not so many as A horizons; neutral reaction; clear wavy lower boundary.

B_{22} 16 to 23 inches, brownish-yellow (dry) to yellowish-brown (moist) light clay loam; like B_{21} horizon, but has less coating on aggregates, fewer roots, and is mildly alkaline; clear lower boundary.

B_3 23 to 27 inches, very pale brown (dry) to light yellowish-brown (moist) stony loam; weak fine subangular blocky structure; contains both siliceous and limestone fragments; friable (moist or dry) to slightly sticky (wet); contains a few tree roots; weakly calcareous but no visible lime; mildly alkaline; abrupt wavy lower boundary.

C_{ca} 27 to 46 inches, white (dry) to very pale brown (moist) massive loam; slightly firm or hard in places but loose and friable (both moist and dry) when disturbed; very high in accumulated soft lime carbonate; contains numerous fragments of limestone; has a few horizontal and diagonal channels filled with decaying and living roots; in deep road cuts,

the dead roots form a continuous, dark-brown, peatlike band up to one inch thick at the boundary between C_{ca} and C horizons; strongly alkaline; lower boundary abrupt and wavy.

C 46 to 60 inches, very pale brown (dry) to yellow (moist) loam; very friable (moist or dry); fills the crevices of the weathered, marblelike limestone; strongly alkaline.

The soils contain some siliceous materials derived from rocks other than limestone. The amounts vary from 50 percent or more near outcrops of sandstone and similar rocks to very little in large areas of limestone. The depth to bedrock ranges from about 30 inches to more than 5 feet. The thickness of the several horizons varies accordingly. Some of the soils contain few stones.

Some steep broken slopes consist of weathered rock rubble, rock outcrops, and bedrock thinly mantled with very weakly developed soils. The soils of the higher elevations are like the Trapper soils except that their A_2 horizons are very thin or missing, and their lime carbonate horizons are much less distinct.

Trapper association, mountainous (Tb).—This association produces commercial timber, poles, posts, and firewood. It provides summer grazing for livestock and supports much wild game.

Victor Series

The Victor soils occur on low fan-terraces on the west side of the valley. They are noncalcareous. Their parent material is gritty fine earth over fresh gravel derived chiefly from granite and gneiss. During the time the soil was developing, the vegetation was grass and open timber. The normal annual precipitation is 13 to 17 inches, and the growing season is relatively long.

The Victor soils have moderately thick, friable, very dark grayish-brown surface soils, and moderately thick, brown, friable gritty loam subsoils. Their substrata of loose sand, gravel, and cobblestones begin at 16 to 24 inches. The soils are shallow to moderately deep. The subsoils are moderately permeable, and the substrata are rapidly permeable. The soils are well to moderately well drained. They have moderately high moisture-supplying capacity and moderately high natural fertility.

The Victor soils are like the Larry soils, but have much better drainage, thinner and lighter colored surface soils, and bright-colored unmottled subsoils. Victor soils have much thicker and darker colored surface soils, and more fine earth in the subsoils, than the Chereete soils. They are like the Bass and Blodgett soils, except that they occur on low fan-terraces and their subsoils and substrata are hard, fresh gravel rather than weathered gravel.

Profile of Victor loam:

A_1 0 to 10 inches, grayish-brown (dry) to very dark grayish-brown (moist) friable loam; weak fine granular structure; neutral reaction.

B_{21} 10 to 16 inches, light grayish-brown (dry) to dark grayish-brown (moist) friable loam; weak granular structure; neutral reaction.

B_{22} 16 to 24 inches, pale-brown (dry) to brown (moist) very friable coarse sandy loam; noncalcareous.

C 24 to 36 inches, very pale brown (dry) to light yellowish-brown (moist), loose, unweathered sand, gravel and cobblestones.

This surface layer is lighter colored where this soil merges with Chereete soils and darker colored where it merges with Larry soils. The depth to loose material ranges from about 12 to 30 inches.

Victor loam, level (Vd).—This is the mapping unit most nearly characteristic of the Victor series. It occurs on fan-terraces of less than 2 percent slope. The surface layer is loam to gritty loam, and the profile is 17 to 24 inches deep over loose sand and gravel. This is the most intensively farmed soil of the Victor series. Important crops are small grains, mixed legume-grass hays, and improved pastures. Small fruits and truck crops are important on some of the smaller farms. Yields are moderately high.

Victor loam, gently sloping (Ve).—This soil differs from Victor loam, level, in being on fan-terraces of 2 to 5 percent. It is used in the same way as the level phase.

Victor loam, imperfectly drained (seeped), level (Vh).—This soil is seeped or subirrigated by excess irrigation water from higher lying lands. It is dry enough to be cultivated in the spring but becomes wet during the summer. It is used mostly for hay and pasture. Because of the seepage, most tilled crops do not do well. Yields are about as good as on normal Victor soils.

Victor cobbly coarse sandy loam, gently sloping and sloping (Va).—This soil occurs at the edges of the fans and on low ridges of 2 to 9 percent slope. There are enough cobblestones in the surface soil to interfere with cultivation. The depth to gravel is normally only 12 to 20 inches. The areas are used chiefly for pasture. They are plowed and cultivated occasionally to prepare the soil for reseeding to pasture.

Victor gravelly coarse sandy loam, level (Vb).—This soil occurs on fan-terraces. Slopes are less than 2 percent. It is 12 to 20 inches deep over gravel. It is used in the same way as Victor loam, level, but is less productive because it is more droughty.

Victor gravelly coarse sandy loam, gently sloping (Vc).—This soil, also on fan-terraces, is like Victor gravelly coarse sandy loam, level, but it is on slopes of 2 to 5 percent. It is used in the same way as the level phase.

Victor gravelly coarse sandy loam, sloping and strongly sloping (Vk).—This unit is on terrace edges. Slopes are from 5 to 15 percent. This soil is used chiefly for pasture.

Victor Series, Calcareous Variant

The calcareous variants of the Victor soils occur west and north of Victor on the fans of Sweathouse Creek and Big Creek. They are like the normal Victor soils except that their substrata are mildly calcareous. Apparently their fine earth is partly derived from limestone.

These soils have moderately thick, very dark grayish-brown, friable loam surface soils, and moderately

thick, brown, friable loam subsoils. Loose and mildly calcareous sand, gravel, and cobblestone substrata begin at depths below 20 inches. These soils are moderately deep and well drained. They have moderately permeable subsoils and rapidly permeable substrata. They have moderately high moisture-supplying capacity and moderately high natural fertility.

Victor loam, calcareous variant, level (Vf).—This soil occurs on low fan-terraces. Slopes are less than 2 percent. It is used in the same way as Victor loam, level, but is slightly more productive.

Victor loam, calcareous variant, gently sloping (Vg).—This soil also occurs on low fan-terraces. Slopes are 2 to 5 percent. It is used in the same way as Victor loam, level.

Victor-St. Joe Complex

This complex is an intricate association of Victor and St. Joe soils on irregular microrelief. The St. Joe soils occur in the swales along intermittent drainageways. The Victor soils occupy the low ridges between the drainage channels. Detailed descriptions of the two soils are given under the Victor and St. Joe series.

Victor-St. Joe cobbly loams, gently sloping (Vl).—The general downstream slopes on which this mapping unit occurs are less than 5 percent, but the surface is very irregular. Because of the irregular relief and the marked contrast in the characteristics of the two soils, the areas are not suitable for cultivation. They are used for pasture.

Wemple-Bitterroot-Ravalli Complex

This complex occurs on the east side of the valley, on somewhat dissected parts of the Tertiary benches. These areas are partly mantled by medium-textured to moderately sandy material consisting of weathered and redeposited products of the underlying unconsolidated Tertiary sediments. These materials are high in volcanic ash, which may be the cause of the stickiness of the soils when moist. These soils were formed under grassland. The Wemple soils (about 65 percent of the complex) have developed in the areas that are mantled by reworked material; and the Bitterroot soils (15 percent of the complex) where weakly consoliated Tertiary sandstone is within 2 or 3 feet of the surface. The rest of the complex is made up of Ravalli soils, locally called "slick spots." The Bitterroot soils have been described under their own series. The Ravalli soils in this complex are like those described under the Burnt Fork-Ravalli complex.

The Wemple soils have moderately thick, very dark grayish-brown, friable surface soils; moderately thick, brown to light olive-brown, firm and sticky sandy clay loam to sandy loam subsoils; and stratified, calcareous loam to loamy fine sand substrata. They are deep, moderately to moderately slowly permeable, and well drained. They have high moisture-supplying capacity and moderately high natural fertility. They are extremely likely to erode when fallow.

The Wemple soils do not have the strong columnar horizons of the associated Ravalli series. The materials of the Wemple soils are better sorted, more sandy, and less calcareous than those of the Burnt Fork series.

Profile of Wemple loam:

A_{11} 0 to 1 inch, light brownish-gray (dry) to dark grayish-brown (moist) fine sandy loam; weak medium crumb structure; soft (dry) to friable (moist).

A_{12} 1 to 6 inches, grayish-brown (dry) to very dark grayish-brown (moist) loam; strong thin and medium platy structure; slightly hard (dry) to friable (moist); slightly acid.

A_3 6 to 8 inches, brown (dry or moist) loam; moderate thick platy and fine blocky structure; slightly hard (dry) to friable (moist) or slightly sticky (wet).

B_{21} 8 to 12 inches, light olive-brown (dry) to brown (moist) fine sandy clay loam; strong medium blocky structure; hard (dry) to firm (moist) or sticky (wet); neutral reaction.

B_{22} 12 to 16 inches, light yellowish-brown (dry) to light olive-brown (moist) fine sandy loam; weak coarse subangular blocky structure; soft (dry) to very friable (moist) or slightly sticky (wet); neutral reaction.

C_1 16 to 28 inches, very pale brown (dry) to pale brown (moist) fine sandy loam; massive structure; soft (dry) to very friable (moist); alkaline to weakly calcareous.

C_{ca} 28 to 40 inches, white (dry) to light-gray (moist) massive loam; moderately calcareous.

D 40 to 48 inches, white loamy fine sand; high in volcanic ash.

The order and thickness of the horizons vary from one place to another. In some places thin strata of coarse sandy or gravelly material may occur at random depths in the profile.

Wemple-Bitterroot-Ravalli complex, level (Wa).—This unit occurs on relatively smooth areas of less than 2 percent slope. Surface textures vary from fine sandy loam to silt loam. Plowed spots of Ravalli soil may have clay loam surface layers. Large areas of these soils have been abandoned for irrigation and are now used for range. Areas which are still irrigated are used like the Burnt Fork-Ravalli soils. They are used principally for alfalfa, red clover, small grains, and improved pastures.

Wemple-Bitterroot-Ravalli complex, gently sloping (Wb).—This mapping unit occurs on relatively smooth areas of 2 to 5 percent slope. It is used in the same way as the level phase of the complex.

Wemple-Bitterroot-Ravalli complex, sloping (Wc).—This mapping unit occurs on slopes of 5 to 9 percent. Some areas have been moderately eroded. The unit is used in the same way as the level phase of the complex.

Wemple-Bitterroot-Ravalli complex, strongly sloping (Wd).—This mapping unit occurs on slopes of 9 to 15 percent. Some areas have been moderately eroded. Most areas are in native sod or introduced perennial grasses and are used for range.

Willoughby Series

The Willoughby soils have lime-cemented hardpans at depths of 18 to 36 inches. They occur in large areas on broad smooth benches such as those of the North and South Burnt Fork Creeks east of Stevensville. The parent materials are more or less cobbly and gravelly, highly calcareous fine earth mantles over the lime-

cemented Tertiary formation. These soils developed under grassland vegetation. During the time the soils were forming, the normal annual precipitation was probably 12 to 14 inches, and the growing season relatively long.

The Willoughby soils have moderately thick, very dark grayish-brown, friable surface soils, and moderately thick, dark grayish-brown, friable loam subsoils. The pale-brown, highly calcareous, friable loam substrata rest abruptly on the impermeable hardpan layer. The pan is usually at depths of 18 to 36 inches, but it may be anywhere between 12 and 48 inches. Drainage is good under dryland conditions; apparently the permeable material is thick enough to absorb all of the rainfall. In irrigated areas the substrata may be mottled. Irrigated soils may become waterlogged. The upper horizons are moderately permeable and have moderately high moisture-supplying capacity. The soils have high natural fertility.

The Willoughby soils differ from the Burnt Fork soils chiefly in having the lime-cemented hardpan.

Willoughby loam, level (We).—This soil occurs on smooth to concave areas of less than 2 percent slope. Cobblestones are scattered or abundant in the surface layer. All of this soil is irrigated. Since the excess water cannot drain downward, the soils become waterlogged if overirrigated. The downslope and concave areas are especially likely to be affected because excess water seeps in from the areas above. This makes the effective rooting zone of these areas even shallower than the depth to the hardpan. Because of the prevailing irrigation practices, the larger areas are often too wet for alfalfa and cultivated crops. They are most commonly used for improved pasture or mixed grass-legume hay. These crops do very well. Fringe and upslope areas, where seepage is not a factor or where excess water rapidly drains away laterally, are successfully used for small grains and other cultivated crops.

Willoughby loam, gently sloping (Wf).—This soil occurs on broad benches. Slopes are 2 to 5 percent. Drainage is like that of Willoughby loam, level, and the two soils are used similarly.

Willoughby loam, sloping (Wg).—This soil occurs on the edges of the benches along local drains. Slopes are 5 to 9 percent. A few areas are as steep as 15 percent. This soil is less likely to become waterlogged than the other phases of Willoughby loam, because the slopes are stronger and because less water seeps in from higher elevations. The areas are used mostly for mixed grass-legume hays. They are also used for small grains and alfalfa.

Woodrock Association, Mountainous

The Woodrock association, mountainous, includes the forested mountainous areas underlain by granite, gneiss, and schist. Most of the association is at elevations above 5,000 feet. Some areas are in the Bitterroot Mountains, where there are many precipitous canyon walls and mountainsides that are mostly rock outcrops. The areas in the Sapphire Mountains have fewer rock outcrops.

The smooth slopes generally are covered with a mantle of weathered granitic material from a foot to several feet thick. In this material various soils have developed. In well-protected sites there is a well-developed soil very similar to the Lick soils except that the underlying granitic material is in place. The most common soil is less well developed but, particularly on lower slopes, has a deep profile. On the sharply convex ridges are weakly developed soils and many rock outcrops.

Woodrock association, mountainous (Wh).—This association was mapped very broadly to show the location of forested areas underlain by granitic and related rocks. Most slopes are steeper than 25 percent. The areas are used for commercial timber production, recreation, and grazing.

Woodside Series

The Woodside soils occur on foot slopes of the Bitterroot Mountains and on terminal moraines pushed out into the valley from the west-side canyons. The parent materials are weathered coarse-textured glacial tills derived mostly from granite, gneiss, and schist. The soils developed under a dense coniferous forest. The normal precipitation is probably 17 to 20 inches, and the growing season is relatively short.

The Woodside soils have moderately thick to thick, light yellowish-brown, loose surface soils. The moderately thick, yellowish-brown, very friable sandy loam subsoils contain subangular blocks of brown light loam. The loose substrata consist of boulders, cobblestones, and sand. The soils are shallow, rapidly permeable, and somewhat excessively drained. They have low moisture-supplying capacity and very low natural fertility.

The Woodside soils are like the Como soils, except that they developed on rough, morainic topography and are a little finer textured. They are much less well developed and much coarser textured than the Lick soils.

Profile of Woodside stony sandy loam:

A_0 1 to 0 inch, very dark gray (dry) to black (moist) organic mat; contains a little mineral matter.

A_1 0 to 1 inch, light brownish-gray (dry) to dark grayish-brown (moist) sandy loam; weak fine crumb structure; loose (dry) to very friable (moist); slightly to medium acid.

A_{21} 1 to 3 inches, pale-brown (dry) to yellowish-brown (moist) light sandy loam; weak medium subangular blocky structure; loose (dry) to very friable (moist); medium acid.

A_{22} 3 to 11 inches, very pale brown (dry) to light yellowish-brown (moist) light sandy loam; weak medium subangular blocky structure; loose (dry) to very friable (moist); medium acid.

B_2 11 to 18 inches, very pale brown (dry) to yellowish-brown (moist) sandy loam; contains firm lumps or subangular blocks of light yellowish-brown (dry) to brown (moist) light loam; soft (dry) to very friable (moist); medium acid.

C 18 to 27 inches, white gravelly sand or loamy sand between boulders and cobblestones.

Stone fragments of various sizes are abundant on and in the soil. The B_2 horizon is not always easy to see. At the lower elevations these soils have well-

defined A_2 horizons, but at higher elevations the A_2 is weak and a B_{ir} horizon is beginning to form.

Woodside stony sandy loam, gently sloping (Wo).—This soil occurs on till slopes of less than 5 percent gradient. It is too stony to be suitable for cultivation. Most areas are still in timber or are cutover brushland. They are used to some extent for grazing.

Woodside stony sandy loam, sloping (Wp).—This soil occurs on slopes of 5 to 9 percent. It is mostly in timber or cutover brushland. It is used to some extent for grazing.

Woodside stony sandy loam, strongly sloping (Wr).—This soil occurs on slopes of 9 to 15 percent. It is mostly in timber or cutover brushland.

Woodside stony sandy loam, moderately steep (Ws).—This soil occurs mostly on slopes of 15 to 25 percent. It was mapped rather broadly in timbered areas and may include small areas of other soils, especially Lick stony loam.

Woodside very stony sandy loam, gently sloping (Wt).—This soil contains so many stones that it is practically paved. It occurs on slopes of less than 2 percent. It is in timber or cutover brush.

Woodside very stony sandy loam, sloping (Wu).—This soil occurs on slopes of 5 to 9 percent. It is in timber or cutover brushland.

Woodside very stony sandy loam, strongly sloping (Wv).—This soil occurs on slopes of 9 to 15 percent. It is in timber.

Woodside very stony sandy loam, moderately steep (Ww).—Most of this soil is on slopes of 15 to 25 percent. The unit was mapped rather broadly in timbered areas, and may include small areas of other soils, particularly Lick stony loam.

Woodside very stony sandy loam, steep (Wx).—Most of this soil is on slopes steeper than 25 percent. The surface soil may be stony sandy loam, very stony sandy loam, or loamy sand. As it was mapped rather broadly in wooded areas, the unit may include small areas of other soils, particularly Lick stony loam.

Woodside sandy loam, gently sloping (Wk).—This soil occurs at lower elevations on slopes of less than 5 percent. The surface soil is sandy loam or loamy sand. It is relatively free of stones. This soil is associated with Como soils, and is used in the same way as Como coarse sandy loam, gently sloping.

Woodside sandy loam, sloping (Wl).—This soil occurs in the same general areas as Woodside sandy loam, gently sloping. It is like the gently sloping phase, except that it is on slopes that range from 5 to 9 percent. The two phases are used similarly.

Woodside sandy loam, strongly sloping (Wm).—This soil occurs in the same general areas as Woodside sandy loam, gently sloping, but it is on slopes of 9 to 15 percent. A few areas are used for improved pasture or for hay, but most areas remain in timber. They are used to some extent for grazing.

Woodside sandy loam, moderately steep (Wn).—This soil occurs on slopes of 15 to 25 percent. It remains in timber.

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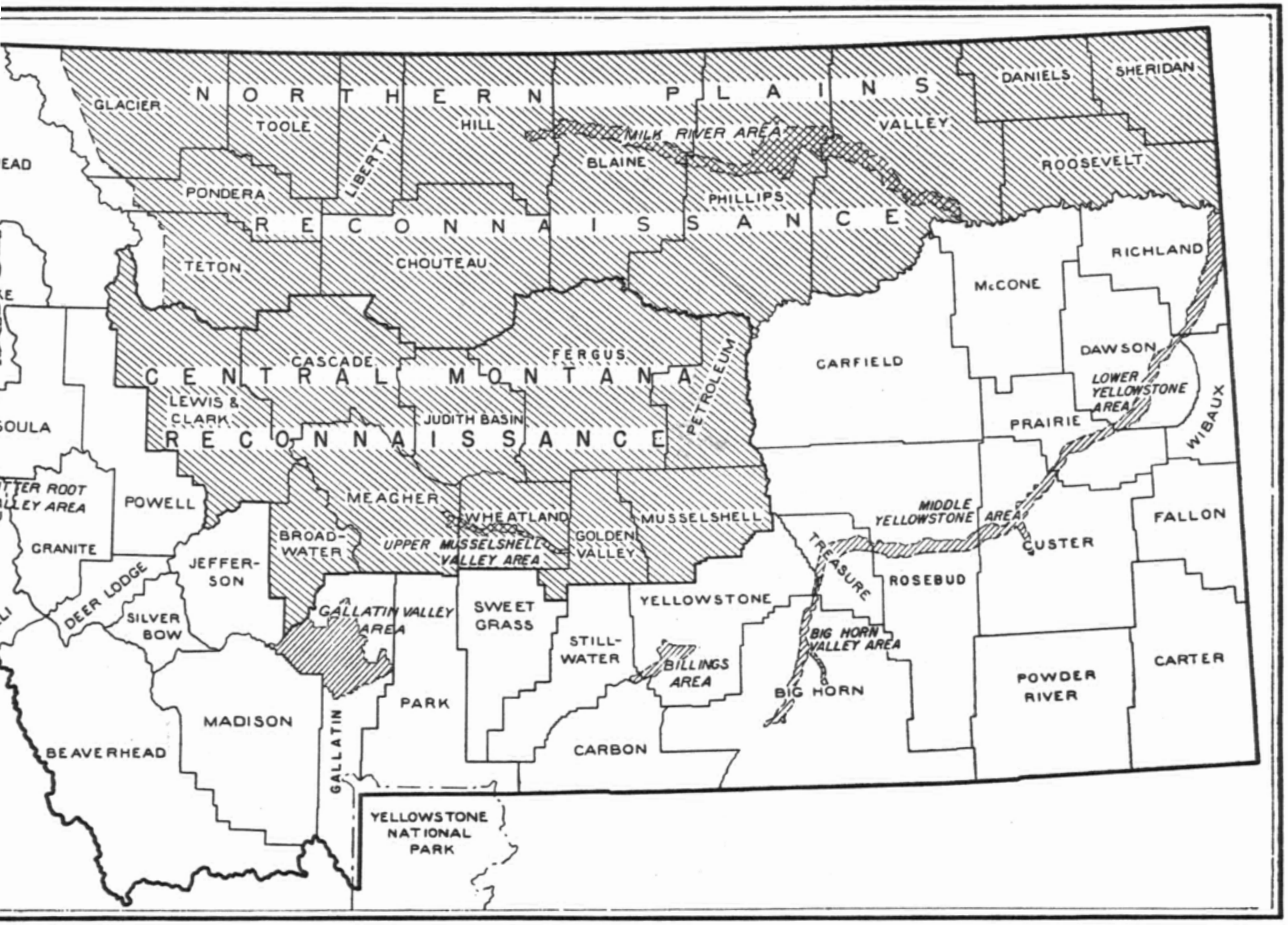

shown by shading. Detailed surveys are shown by northeast-southwest hatching; reconnaissance surveys are shown by northwest-southeast hatching; crosshatching indicates areas covered by both detailed and reconnaissance surveys.

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BITTERROOT VALLEY AREA, MONTANA

COLOR GROUPING

LEVEL AND GENTLY SLOPING WELL-DRAINED DEEP LOAMY SOILS.

- Ah Amsterdam silt loam, level
- Ak Amsterdam silt loam, gently sloping
- An Amsterdam-Haccke silt loams, gently sloping
- Bl Bass-Ravalli loams, gently sloping
- Bn Bitterroot silt loam, level
- Bo Bitterroot silt loam, gently sloping
- Bs Bitterroot-Burnt Fork cobbly loams, gently sloping
- B2y Burnt Fork cobbly loam, gently sloping
- B3b Burnt Fork gravelly loam, level
- B3c Burnt Fork gravelly loam, gently sloping
- B3f Burnt Fork loam, level
- B3g Burnt Fork loam, gently sloping
- B3o Burnt Fork-Ravalli cobbly loams, gently sloping
- B3s Burnt Fork-Ravalli loams, level
- B3t Burnt Fork-Ravalli loams, gently sloping
- B3w Burnt Fork-Ravalli loams, arkosic variants, gently sloping
- Cf Charlos loam, gently sloping
- Ck Charlos silt loam, level
- Cl Charlos silt loam, gently sloping
- Gl Gird fine sandy loam, sandy subsoil variant, gently sloping
- Gt Gird silt loam, high lime subsoil variant, gently sloping
- G2f Gorus silt loam, gently sloping
- Ha Hamilton fine sandy loam, level
- Hb Hamilton fine sandy loam, gently sloping
- Hc Hamilton silt loam, level
- Hd Hamilton silt loam, gently sloping
- He Hamilton-Corvallis sandy loams, level
- Hf Hamilton-Corvallis silt loams, level
- Ka Kenspur fine sandy loam
- Lo Lick gravelly loam, gently sloping
- Lu Lick loam, gently sloping
- Ma Maiden-Gird silt loams, gently sloping
- Sy Skalkaho-Ravalli loams, gently sloping
- S2h Slocum loam, deep
- S3a Sula silt loam, level
- S3b Sula silt loam, gently sloping
- Wa Wemple-Bitterroot-Ravalli complex, level
- Wb Wemple-Bitterroot-Ravalli complex, gently sloping

SLOPING AND STRONGLY SLOPING WELL-DRAINED DEEP LOAMY SOILS.

- Al Amsterdam silt loam, sloping
- Ao Amsterdam-Haccke silt loams, sloping
- Ap Amsterdam-Haccke silt loams, strongly sloping
- Bm Bass-Ravalli loams, sloping and strongly sloping
- Bp Bitterroot silt loam, sloping
- Br Bitterroot silt loam, strongly sloping
- Bt Bitterroot-Burnt Fork cobbly loams, sloping
- Bu Bitterroot-Burnt Fork cobbly loams, strongly sloping
- B2t Brownlee-Duffy-Ravalli loams, sloping
- B2u Brownlee-Duffy-Ravalli loams, strongly sloping
- B2z Burnt Fork cobbly loam, sloping
- B3a Burnt Fork cobbly loam, strongly sloping
- B3d Burnt Fork gravelly loam, sloping
- B3e Burnt Fork gravelly loam, strongly sloping
- B3h Burnt Fork loam, sloping
- B3k Burnt Fork loam, strongly sloping
- B3p Burnt Fork-Ravalli cobbly loams, sloping
- B3r Burnt Fork-Ravalli cobbly loams, strongly sloping
- B3u Burnt Fork-Ravalli loams, sloping
- B3v Burnt Fork-Ravalli loams, strongly sloping
- B3x Burnt Fork-Ravalli loams, arkosic variants, sloping
- B3y Burnt Fork-Ravalli loams, arkosic variants, strongly sloping
- Cg Charlos loam, sloping
- Ch Charlos loam, strongly sloping
- C3h Cooney loam, sloping
- C3k Cooney loam, strongly sloping
- C3n Cooney-Hacke silt loams, strongly sloping
- Gm Gird fine sandy loam, sandy subsoil variant, strongly sloping
- Go Gird silt loam, sloping
- Gp Gird silt loam, strongly sloping
- Gu Gird silt loam, high lime subsoil variant, sloping
- Gv Gird silt loam, high lime subsoil variant, strongly sloping
- Gy Gird-Haccke silt loams, sloping
- Gz Gird-Haccke silt loams, strongly sloping
- G2c Gird-Teton-Haccke loams, strongly sloping
- G2g Gorus silt loam, sloping
- G2h Gorus silt loam, strongly sloping
- Lp Lick gravelly loam, sloping
- Lr Lick gravelly loam, strongly sloping
- Lw Lick loam, sloping
- Lx Lick loam, strongly sloping
- Mb Maiden-Gird silt loams, sloping
- Mc Maiden-Gird silt loams, strongly sloping
- Rf Ravalli-Bitterroot loams, shallow, strongly sloping
- Sf Shook coarse sandy loam, sloping
- Sg Shook coarse sandy loam, strongly sloping
- Sk Skaggs silt loam, sloping
- Sl Skaggs silt loam, strongly sloping
- Sz Skalkaho-Ravalli loams, sloping
- S2a Skalkaho-Ravalli loams, strongly sloping
- S2o Sogn-Skaggs loams and stony loams, strongly sloping
- S2x Sula loam variant-Ravalli loam, gently sloping and sloping
- S2y Sula loam variant-Ravalli loam, strongly sloping
- S3c Sula silt loam, sloping
- S3d Sula silt loam, strongly sloping
- S3e Sula-Haccke silt loams, sloping
- S3f Sula-Haccke silt loams, strongly sloping
- Wc Wemple-Bitterroot-Ravalli complex, sloping
- Wd Wemple-Bitterroot-Ravalli complex, strongly sloping
- Wg Willoughby loam, sloping

LEVEL AND GENTLY SLOPING WELL-DRAINED SOILS, MODERATELY DEEP OVER GRAVEL.

- Aa Adel loam, level
- Ab Adel loam, gently sloping
- Ba Bass cobbly coarse sandy loam, gently sloping
- Bd Bass gravelly coarse sandy loam, gently sloping
- Bg Bass coarse sandy loam, gently sloping
- Bw Blodgett cobbly coarse sandy loam, gently sloping
- Bz Blodgett gravelly coarse sandy loam, gently sloping
- B2c Blodgett coarse sandy loam, gently sloping
- B2m Breece sandy loam, level
- B2n Breece sandy loam, gently sloping
- B2p Breece loamy coarse sand, gently sloping
- Cb Chamokane fine sandy loam
- Cd Chamokane loamy fine sand
- C2k Clark Fork loam, level
- C2l Clark Fork loam, gently sloping
- G2n Grantsdale loam, level
- G2o Grantsdale loam, gently sloping
- G2s Grantsdale-Dominic cobbly loams, level
- G2t Grantsdale-Dominic cobbly loams, gently sloping
- G2w Greeley sandy loam, level
- L2f Lolo cobbly loam, gently sloping
- L2g Lolo gravelly loam, level
- L2h Lolo gravelly loam, gently sloping
- Va Victor cobbly coarse sandy loam, gently sloping and sloping
- Vb Victor gravelly coarse sandy loam, level
- Vc Victor gravelly coarse sandy loam, gently sloping
- Vd Victor loam, level
- Ve Victor loam, gently sloping
- Vf Victor loam, calcareous variant, level
- Vg Victor loam, calcareous variant, gently sloping

SLOPING AND STRONGLY SLOPING WELL-DRAINED SOILS, MODERATELY DEEP OVER GRAVEL.

- Ac Adel loam, sloping
- Bb Bass cobbly coarse sandy loam, sloping
- Bc Bass cobbly coarse sandy loam, strongly sloping
- Be Bass gravelly coarse sandy loam, sloping
- Bf Bass gravelly coarse sandy loam, strongly sloping
- Bh Bass coarse sandy loam, sloping
- Bk Bass coarse sandy loam, strongly sloping
- Bx Blodgett cobbly coarse sandy loam, sloping
- By Blodgett cobbly coarse sandy loam, strongly sloping
- B2a Blodgett gravelly coarse sandy loam, sloping
- B2b Blodgett gravelly coarse sandy loam, strongly sloping
- B2d Blodgett coarse sandy loam, sloping
- B2e Blodgett coarse sandy loam, strongly sloping
- B2o Breece sandy loam, sloping
- B2r Breece loamy coarse sand, sloping
- Vk Victor gravelly coarse sandy loam, sloping and strongly sloping

LEVEL AND GENTLY SLOPING SOMEWHAT EXCESSIVELY DRAINED SOILS, SHALLOW OVER GRAVEL.

- B2h Breece gravelly loamy coarse sand, gently sloping
- Cc Chamokane gravelly loamy sand, shallow
- Ce Chamokane loamy sand-sandy loam, shallow
- Co Chereete gravelly coarse sandy loam, level
- Cp Chereete gravelly coarse sandy loam, gently sloping
- Cs & Cu Chereete sandy loam, level
- Ct & Cv Chereete sandy loam, gently sloping
- Cw Chereete stony coarse sandy loam, level
- Cx Chereete stony coarse sandy loam, gently sloping
- Cz Chereete very stony coarse sandy loam, level
- C2a Chereete very stony coarse sandy loam, gently sloping
- C2c Clark Fork cobbly sandy loam, level
- C2d Clark Fork cobbly sandy loam, gently sloping
- C2f Clark Fork fine sandy loam, level
- C2g Clark Fork fine sandy loam, gently sloping
- C2h Clark Fork gravelly fine sandy loam, level
- C2o Como gravelly coarse sandy loam, gently sloping
- C2u Como coarse sandy loam, gently sloping
- C2y Como stony coarse sandy loam, gently sloping
- C3c Como stony and very stony coarse sandy loams, gently sloping
- Da Dominic cobbly loam, level
- Db Dominic cobbly loam, gently sloping
- Dc Dominic gravelly loamy sand, level
- Dd Dominic gravelly loamy sand, gently sloping
- De Dominic very cobbly sandy loam, level
- Df Dominic very cobbly sandy loam, gently sloping
- G2p Grantsdale loam, shallow, and Dominic sandy loam, level
- G2r Grantsdale loam, shallow, and Dominic sandy loam, gently sloping
- G2x Greeley sandy loam, gently sloping
- L2k Lone Rock cobbly coarse sandy loam, level
- L2l Lone Rock fine sandy loam, dark colored variant, level
- L2m Lone Rock coarse sandy loam, level
- L2n Lone Rock coarse sandy loam, gently sloping
- Rg Riverside cobbly loam, gently sloping
- Rk Riverside cobbly sandy loam, gently sloping
- Rm Riverside fine sandy loam, gently sloping
- Rn Riverside fine sandy loam, sloping
- Rr Riverside gravelly sandy loam, gently sloping
- Rt Riverside loam, level
- Ru Riverside loam, gently sloping
- Sp Skalkaho gravelly loam, gently sloping
- Sr Skalkaho gravelly coarse sandy loam, micaceous variant, gently sloping
- Wk Woodside sandy loam, gently sloping
- Wo Woodside stony sandy loam, gently sloping
- Wt Woodside very stony sandy loam, gently sloping

SLOPING AND STRONGLY SLOPING SOMEWHAT EXCESSIVELY DRAINED SOILS, SHALLOW OVER GRAVEL.

- B2k Breece gravelly loamy coarse sand, sloping
- B2l Breece gravelly loamy coarse sand, strongly sloping
- B2s Breece loamy coarse sand, strongly sloping
- Cr Chereete gravelly coarse sandy loam, sloping
- Cy Chereete stony coarse sandy loam, sloping
- C2b Chereete very stony coarse sandy loam, sloping
- C2e Clark Fork cobbly sandy loam, sloping
- C2m Clark Fork very stony sandy loam, gently sloping and sloping
- C2n Clark Fork very stony sandy loam, strongly sloping
- C2p Como gravelly coarse sandy loam, sloping
- C2r Como gravelly coarse sandy loam, strongly sloping
- C2v Como coarse sandy loam, sloping
- C2w Como coarse sandy loam, strongly sloping
- C2z Como stony coarse sandy loam, sloping
- C3a Como stony coarse sandy loam, strongly sloping
- C3d Como stony and very stony coarse sandy loams, sloping
- C3e Como stony and very stony coarse sandy loams, strongly sloping
- G2y Greeley sandy loam, sloping
- L2o Lone Rock coarse sandy loam, sloping
- Rh Riverside cobbly loam, sloping
- Rl Riverside cobbly sandy loam, sloping
- Ro Riverside fine sandy loam, strongly sloping
- Rp Riverside gravelly and cobbly sandy loams, strongly sloping
- Rs Riverside gravelly sandy loam, sloping
- Rv Riverside loam, sloping
- Rw Riverside loam, strongly sloping
- Ss Skalkaho gravelly loam, sloping
- St Skalkaho gravelly coarse sandy loam, micaceous variant, sloping
- Su Skalkaho gravelly loam, strongly sloping
- Sv Skalkaho gravelly coarse sandy loam, micaceous variant, strongly sloping
- Wl Woodside sandy loam, sloping
- Wm Woodside sandy loam, strongly sloping
- Wp Woodside stony sandy loam, sloping
- Wr Woodside stony sandy loam, strongly sloping
- Wu Woodside very stony sandy loam, sloping
- Wv Woodside very stony sandy loam, strongly sloping

GENTLY SLOPING TO STRONGLY SLOPING STONY SOILS.

- B2f Blodgett, Bass, and Victor very stony soils
- B3l Burnt Fork very stony loam, gently sloping and sloping
- B3m Burnt Fork very stony loam, strongly sloping
- Cm Castner stony loam, sloping and strongly sloping
- G2u Grantsdale and Dominic soils, very shallow, strongly sloping
- La Laporte stony loam, sloping and strongly sloping
- L2b Lick stony loam, sloping
- L2c Lick stony loam, strongly sloping
- Ra Ravalli-Bitterroot cobbly loams, shallow, gently sloping
- Rb Ravalli-Bitterroot cobbly loams, shallow, sloping
- Rc Ravalli-Bitterroot cobbly loams, shallow, strongly sloping
- S2c Skalkaho-Ravalli stony loams, sloping and strongly sloping
- S2t Stecum coarse sandy loam, strongly sloping
- S2u Stecum stony loamy coarse sand, sloping
- S2v Stecum stony loamy coarse sand, strongly sloping

MODERATELY STEEP AND STEEP SOILS.

- Am Amsterdam silt loam, moderately steep and steep
- Bv Bitterroot, Wemple, and Ravalli soils, shallow, moderately steep and steep
- B2g Blodgett and Bass soils, undifferentiated, moderately steep and steep
- B2v Brownlee-Duffy-Ravalli loams, moderately steep
- B2w Brownlee-Duffy-Ravalli loams, steep
- B3n Burnt Fork and Bitterroot soils, undifferentiated, moderately steep and steep
- Cn Castner stony loam, moderately steep and steep
- C2s Como gravelly coarse sandy loam, moderately steep
- C2t Como gravelly coarse sandy loam, steep
- C2x Como coarse sandy loam, moderately steep
- C3b Como stony coarse sandy loam, moderately steep
- C3f Como stony and very stony coarse sandy loams, moderately steep
- C3g Como stony and very stony coarse sandy loams, steep
- C3l Cooney loam, moderately steep
- C3o Cooney-Hacke silt loams, moderately steep
- Gn Gird fine sandy loam, sandy subsoil variant, moderately steep and steep
- Gr Gird silt loam, moderately steep
- Gs Gird silt loam, steep
- Gw Gird silt loam, high lime subsoil variant, moderately steep
- Gx Gird silt loam, high lime subsoil variant, steep
- G2a Gird-Hacke silt loams, moderately steep
- G2b Gird-Hacke silt loams, steep
- G2d Gird-Teton-Hacke loams, moderately steep
- G2e Gird-Teton-Hacke loams, steep
- G2k Gorus silt loam, moderately steep
- Lb Laporte stony loam, moderately steep and steep
- Ls Lick gravelly loam, moderately steep
- Ly Lick loam, moderately steep
- L2d Lick stony loam, moderately steep
- L2e Lick stony loam, steep
- Md Maiden-Gird silt loams, moderately steep
- Rx Riverside soils, moderately steep and steep
- Sh Shook coarse sandy loam, moderately steep
- Sm Skaggs silt loam, moderately steep
- Sn Skaggs silt loam, steep
- Sw Skalkaho gravelly loam, moderately steep
- Sx Skalkaho gravelly coarse sandy loam, micaceous variant, moderately steep
- S2b Skalkaho-Ravalli loams, moderately steep
- S2d Skalkaho-Ravalli stony loams, moderately steep and steep
- S2p Sogn-Skaggs loams and stony loams, moderately steep
- S2w Stecum stony loamy coarse sand, moderately steep and steep
- S2z Sula loam variant-Ravalli loam, moderately steep and steep
- Wn Woodside sandy loam, moderately steep
- Ws Woodside stony sandy loam, moderately steep
- Ww Woodside very stony sandy loam, moderately steep
- Wx Woodside very stony sandy loam, steep

LOAMY SOILS SHALLOW OR MODERATELY DEEP OVER HARDPAN OR BEDROCK.

- C3m Cooney-Hacke silt loams, sloping
- Rd Ravalli-Bitterroot loams, shallow, gently sloping
- Re Ravalli-Bitterroot loams, shallow, sloping
- S2r Stecum coarse sandy loam, gently sloping
- S2s Stecum coarse sandy loam, sloping
- We Willoughby loam, level
- Wf Willoughby loam, gently sloping

MODERATELY WELL-DRAINED SOILS.

- C3p Corvallis silt loam
- Ga Gallatin loam, drained, level
- Gb Gallatin loam, drained, gently sloping
- Ld Larry clay loam, drained, level
- Le Larry clay loam, drained, gently sloping
- Lk Larry silt loam, drained, level
- Lm Larry silt loam, drained, gently sloping
- Sd St. Joe loam and clay loam, drained, level
- Se St. Joe loam and clay loam, drained, gently sloping
- S2g Slocum loam
- S2m Slocum sandy loam-gravelly sandy loam, shallow
- Vh Victor loam, imperfectly drained (seeped), level

SLIGHTLY TO MODERATELY SALINE SOILS, MODERATELY WELL-DRAINED TO IMPERFECTLY DRAINED.

- C3s Corvallis silt loam, slightly saline
- C3t Corvallis silt loam, moderately saline
- C3u Corvallis silt loam, cobbly subsoil
- C3v Corvallis silt loam, moderately shallow, slightly saline
- G2l Grantsdale cobbly loam, imperfectly drained variant, level
- G2m Grantsdale cobbly loam, imperfectly drained variant, slightly saline, level
- S2e Slocum complex, shallow, slightly saline
- S2f Slocum complex, shallow, moderately saline
- S2k Slocum loam, slightly saline

IMPERFECTLY-DRAINED AND POORLY-DRAINED SOILS.

- B3z Burnt Fork and Riverside loams, imperfectly drained (seeped), level and gently sloping
- B4a Burnt Fork and Riverside loams, imperfectly drained (seeped), sloping and strongly sloping
- B4b Burnt Fork and Riverside loams, imperfectly drained (seeped), moderately steep
- C3r Corvallis silt loam, poorly drained variant
- Gc Gallatin loam-gravelly loam, level
- Gd Gallatin silt loam, level
- Ge Gallatin silt loam, gently sloping
- Gf Gallatin silty clay loam, level
- Gh Gallatin-shallow muck complex, level
- Gk Gallatin-shallow muck complex, gently sloping
- Lc Larry clay loam, level
- Lf Larry clay loam, gently sloping
- Lg Larry clay loam, sloping
- Lh Larry silt loam, level
- Ll Larry silt loam, gently sloping
- Ln Larry silt loam, sloping
- Lt Lick loam, imperfectly drained variant, level
- Lv Lick loam, imperfectly drained variant, gently sloping
- Lz Lick loam, imperfectly drained variant, sloping
- L2a Lick loam, imperfectly drained variant, strongly sloping
- Pa Peat
- Pb Peat, shallow over silt
- Pc Peat, shallow over gravel
- Pd Poverty cobbly loam, level
- Pe Poverty cobbly loam, gently sloping
- Pf Poverty cobbly loam, sloping
- Pg Poverty loam, gently sloping
- Ph Poverty coarse sandy loam, level
- Pk Poverty coarse sandy loam, gently sloping
- Pl Poverty coarse sandy loam, sloping
- Pm Poverty very stony coarse sandy loam, gently sloping
- Pn Poverty very stony coarse sandy loam, sloping
- Sa St. Joe loam and clay loam, level
- Sb St. Joe loam and clay loam, gently sloping
- Sc St. Joe loam and clay loam, sloping
- S2l Slocum loam, poorly drained variant
- Vl Victor-St. Joe cobbly loams, gently sloping

SOIL ASSOCIATIONS OF MOUNTAINS UNDER GRASSLANDS.

- B2x Brownlee-Stecum association, mountainous
- So Skaggs-Sogn association, mountainous
- Ta Teton-Cheadle association, mountainous

SOIL ASSOCIATIONS OF MOUNTAINS UNDER FOREST.

- Hg Holloway association, mountainous
- Tb Trapper association, mountainous
- Wh Woodrock association, mountainous

SOILS OF FLOODPLAINS AND NARROW MOUNTAIN VALLEYS.

- Ad Alluvial cobbly land, level
- Ae Alluvial cobbly land, gently sloping and sloping
- Af Alluvial loamy land
- Ag Alluvial land and valley slopes
- Ca Chamokane complex
- Ry Riverwash
- S2n Slocum-shallow muck complex

GRAVEL PITS AND DUMPS.

- G2v Gravel pits and dumps

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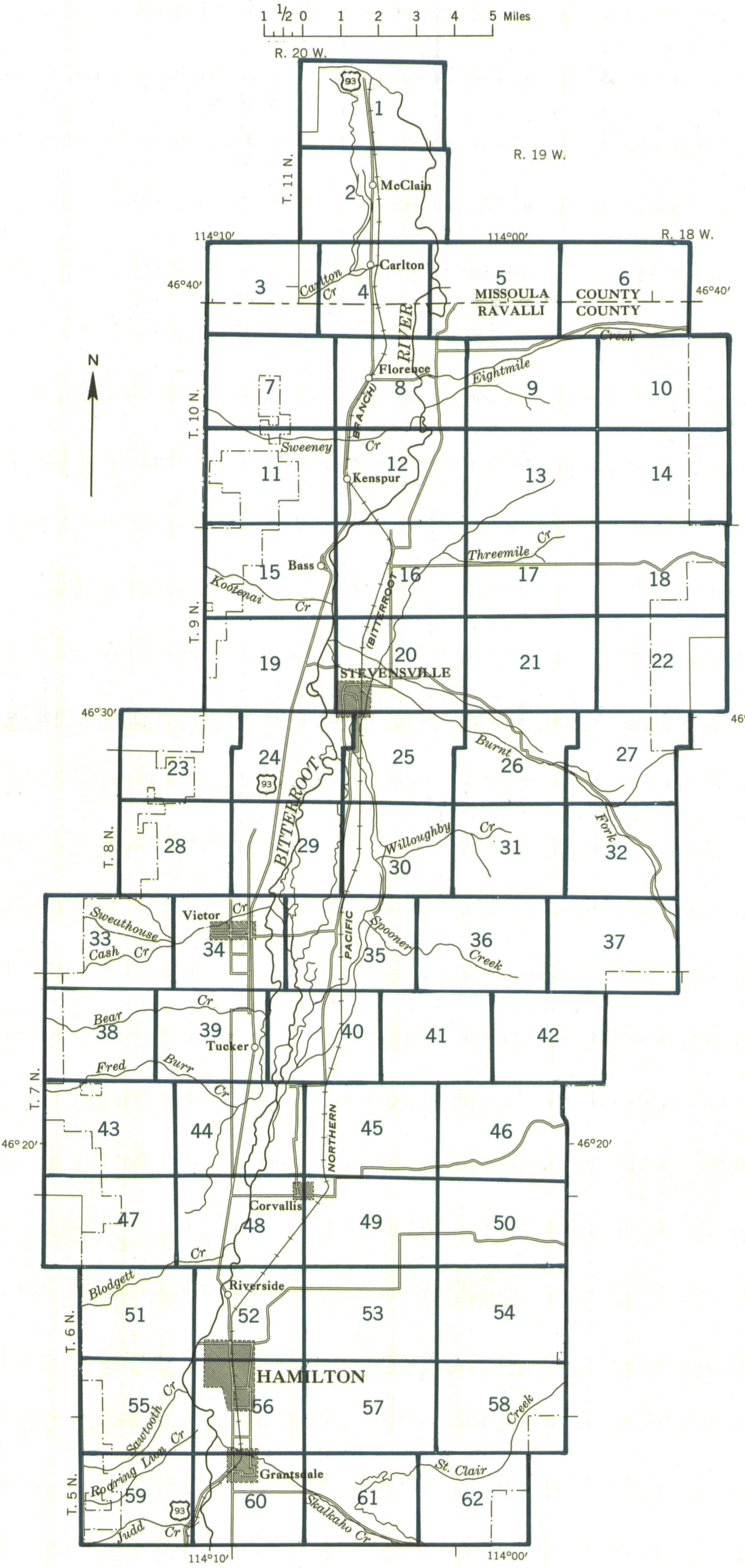
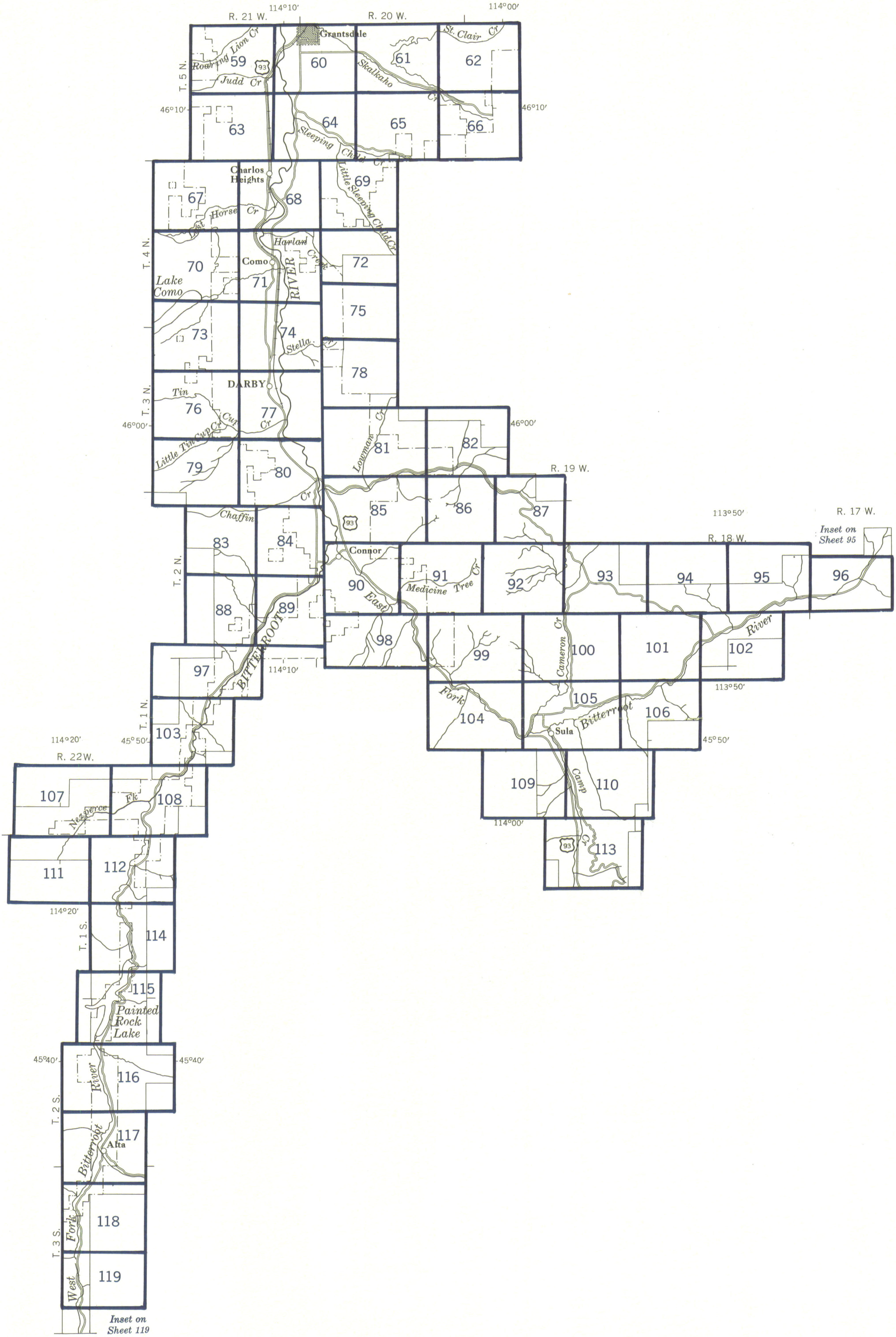
BITTERROOT VALLEY AREA, MONTANA





R. 21 W.
114°10′
R. 20 W.
114°00′
Grantsdale
Roaring Lion Cr
59
60
61
62
St. Clair Cr
Skalkaho Cr
Judd Cr
T. 5 N.
46°10′
63
64
65
66
Sleeping Child Cr
Charlos Heights
67
68
69
Little Sleeping Child Cr
Lost Horse Cr
T. 4 N.
70
71
72
Harlan Creek
Como
Lake Como
RIVER
73
74
75
Stella Cr
78
T. 3 N.
DARBY
76
77
Tin Cup Cr
46°00′
Little Tin Cup Cr
79
80
81
82
Lowman Cr
R. 19 W.
Chaffin Cr
83
84
85
86
87
T. 2 N.
Connor
88
89
90
91
92
93
94
95
96
Medicine Tree Cr
East
BITTERROOT
113°50′
R. 18 W.
R. 17 W.
Inset on Sheet 95
97
98
99
100
101
102
Cameron Cr
River
114°10′
113°50′
Fork
103
104
105
106
Sula
Bitterroot
T. 1 N.
114°20′
45°50′
45°50′
R. 22W.
107
108
109
110
Nezperce Fk
Camp Cr
114°00′
111
112
113
114°20′
114
T. 1 S.
115
Painted Rock Lake
45°40′
45°40′
116
River
T. 2 S.
117
Alta
Bitterroot
118
Fork
T. 3 S.
119
West
Inset on Sheet 119

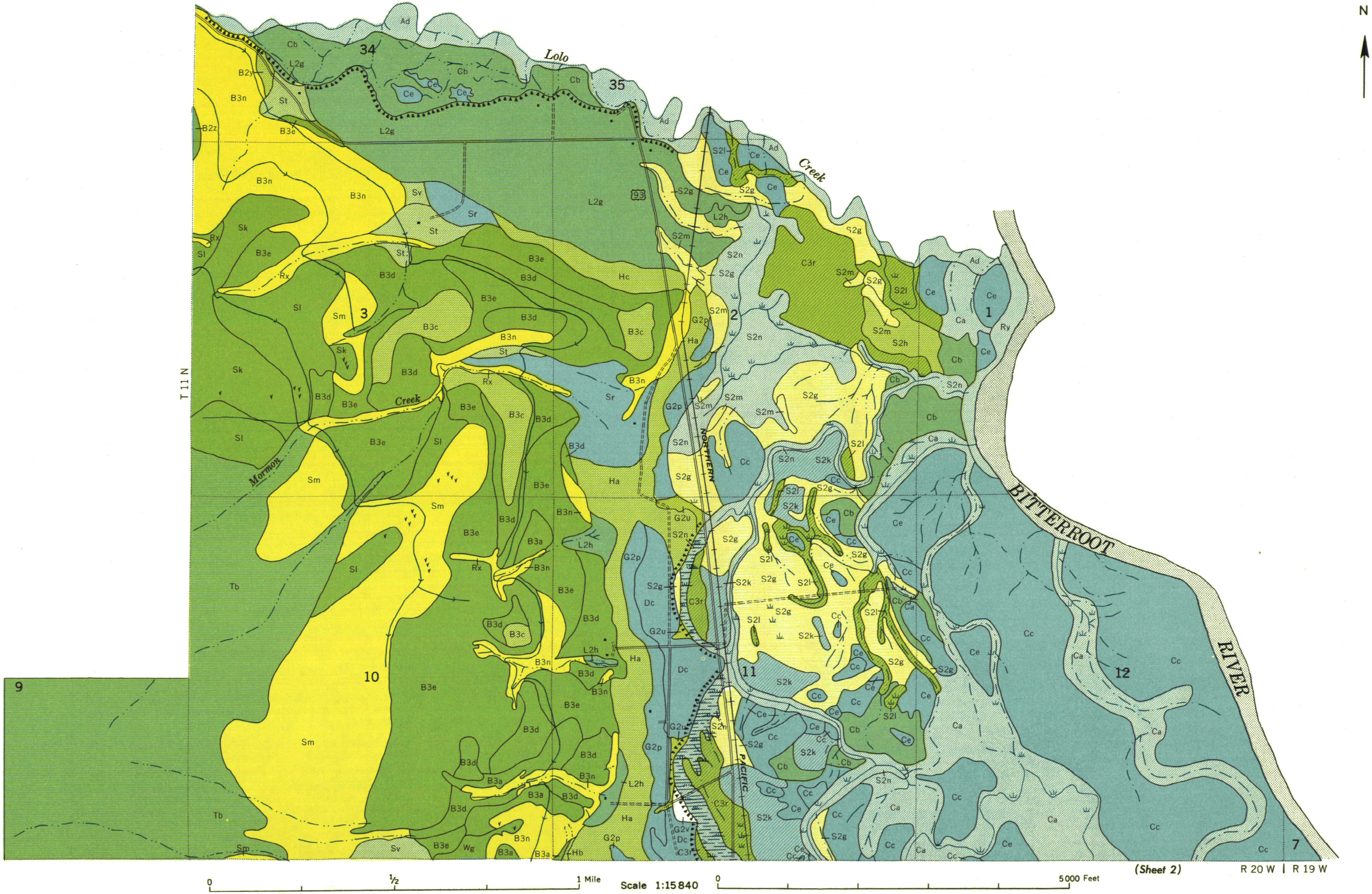
BITTERROOT VALLEY AREA, MONTANA

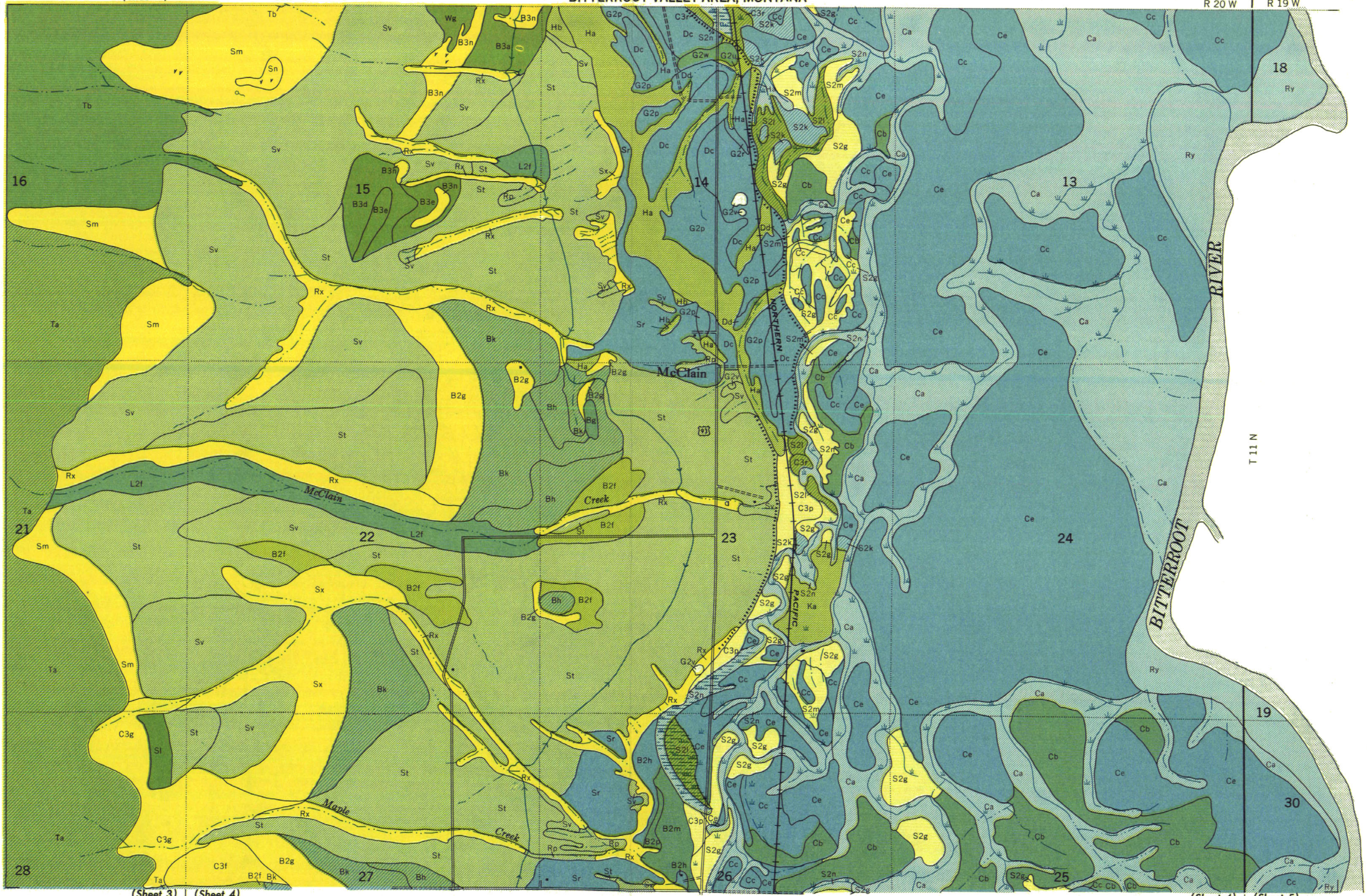
SOIL LEGEND

SYMBOL	NAME
Aa	Adel loam, level
Ab	Adel loam, gently sloping
Ac	Adel loam, sloping
Ad	Alluvial cobbly land, level
Ae	Alluvial cobbly land, gently sloping and sloping
Af	Alluvial loamy land
Ag	Alluvial land and valley slopes
Ah	Amsterdam silt loam, level
Ak	Amsterdam silt loam, gently sloping
Al	Amsterdam silt loam, sloping
Am	Amsterdam silt loam, moderately steep and steep
An	Amsterdam-Haccke silt loams, gently sloping
Ao	Amsterdam-Haccke silt loams, sloping
Ap	Amsterdam-Haccke silt loams, strongly sloping
Ba	Bass cobbly coarse sandy loam, gently sloping
Bb	Bass cobbly coarse sandy loam, sloping
Bc	Bass cobbly coarse sandy loam, strongly sloping
Bd	Bass gravelly coarse sandy loam, gently sloping
Be	Bass gravelly coarse sandy loam, sloping
Bf	Bass gravelly coarse sandy loam, strongly sloping
Bg	Bass coarse sandy loam, gently sloping
Bh	Bass coarse sandy loam, sloping
Bk	Bass coarse sandy loam, strongly sloping
Bl	Bass-Ravalli loams, gently sloping
Bm	Bass-Ravalli loams, sloping and strongly sloping
Bn	Bitterroot silt loam, level
Bo	Bitterroot silt loam, gently sloping
Bp	Bitterroot silt loam, sloping
Br	Bitterroot silt loam, strongly sloping
Bs	Bitterroot-Burnt Fork cobbly loams, gently sloping
Bt	Bitterroot-Burnt Fork cobbly loams, sloping
Bu	Bitterroot-Burnt Fork cobbly loams, strongly sloping
Bv	Bitterroot, Wemple, and Ravalli soils, shallow, moderately steep and steep
Bw	Blodgett cobbly coarse sandy loam, gently sloping
Bx	Blodgett cobbly coarse sandy loam, sloping
By	Blodgett cobbly coarse sandy loam, strongly sloping
Bz	Blodgett gravelly coarse sandy loam, gently sloping
B2a	Blodgett gravelly coarse sandy loam, sloping
B2b	Blodgett gravelly coarse sandy loam, strongly sloping
B2c	Blodgett coarse sandy loam, gently sloping
B2d	Blodgett coarse sandy loam, sloping
B2e	Blodgett coarse sandy loam, strongly sloping
B2f	Blodgett, Bass, and Victor very stony soils
B2g	Blodgett and Bass soils, undifferentiated, moderately steep and steep
B2h	Breece gravelly loamy coarse sand, gently sloping
B2k	Breece gravelly loamy coarse sand, sloping
B2l	Breece gravelly loamy coarse sand, strongly sloping
B2m	Breece sandy loam, level
B2n	Breece sandy loam, gently sloping
B2o	Breece sandy loam, sloping
B2p	Breece loamy coarse sand, gently sloping
B2r	Breece loamy coarse sand, sloping
B2s	Breece loamy coarse sand, strongly sloping
B2t	Brownlee-Duffy-Ravalli loams, sloping
B2u	Brownlee-Duffy-Ravalli loams, strongly sloping
B2v	Brownlee-Duffy-Ravalli loams, moderately steep
B2w	Brownlee-Duffy-Ravalli loams, steep
B2x	Brownlee-Stecum association, mountainous
B2y	Burnt Fork cobbly loam, gently sloping
B2z	Burnt Fork cobbly loam, sloping
B3a	Burnt Fork cobbly loam, strongly sloping
B3b	Burnt Fork gravelly loam, level
B3c	Burnt Fork gravelly loam, gently sloping
B3d	Burnt Fork gravelly loam, sloping
B3e	Burnt Fork gravelly loam, strongly sloping
B3f	Burnt Fork loam, level
B3g	Burnt Fork loam, gently sloping
B3h	Burnt Fork loam, sloping
B3k	Burnt Fork loam, strongly sloping
B3l	Burnt Fork very stony loam, gently sloping and sloping
B3m	Burnt Fork very stony loam, strongly sloping
B3n	Burnt Fork and Bitterroot soils, undifferentiated, moderately steep and steep
B3o	Burnt Fork-Ravalli cobbly loams, gently sloping
B3p	Burnt Fork-Ravalli cobbly loams, sloping
B3r	Burnt Fork-Ravalli cobbly loams, strongly sloping
B3s	Burnt Fork-Ravalli loams, level
B3t	Burnt Fork-Ravalli loams, gently sloping
B3u	Burnt Fork-Ravalli loams, sloping
B3v	Burnt Fork-Ravalli loams, strongly sloping
B3w	Burnt Fork-Ravalli loams, arkosic variants, gently sloping
B3x	Burnt Fork-Ravalli loams, arkosic variants, sloping
B3y	Burnt Fork-Ravalli loams, arkosic variants, strongly sloping
B3z	Burnt Fork and Riverside loams, imperfectly drained (seeped), level and gently sloping
B4a	Burnt Fork and Riverside loams, imperfectly drained (seeped), sloping and strongly sloping
B4b	Burnt Fork and Riverside loams, imperfectly drained (seeped), moderately steep
Ca	Chamokane complex
Cb	Chamokane fine sandy loam
Cc	Chamokane gravelly loamy sand, shallow
Cd	Chamokane loamy fine sand
Ce	Chamokane loamy sand-sandy loam, shallow
Cf	Charlos loam, gently sloping
Cg	Charlos loam, sloping
Ch	Charlos loam, strongly sloping
Ck	Charlos silt loam, level
Cl	Charlos silt loam, gently sloping
Cm	Castner stony loam, sloping and strongly sloping
Cn	Castner stony loam, moderately steep and steep
Co	Chereete gravelly coarse sandy loam, level
Cp	Chereete gravelly coarse sandy loam, gently sloping
Cr	Chereete gravelly coarse sandy loam, sloping
Cs & Cu	Chereete sandy loam, level
Ct & Cv	Chereete sandy loam, gently sloping
Cw	Chereete stony coarse sandy loam, level
Cx	Chereete stony coarse sandy loam, gently sloping
Cy	Chereete stony coarse sandy loam, sloping
Cz	Chereete very stony coarse sandy loam, level
C2a	Chereete very stony coarse sandy loam, gently sloping
C2b	Chereete very stony coarse sandy loam, sloping
C2c	Clark Fork cobbly sandy loam, level
C2d	Clark Fork cobbly sandy loam, gently sloping
C2e	Clark Fork cobbly sandy loam, sloping
C2f	Clark Fork fine sandy loam, level
C2g	Clark Fork fine sandy loam, gently sloping
C2h	Clark Fork gravelly fine sandy loam, level
C2k	Clark Fork loam, level
C2l	Clark Fork loam, gently sloping
C2m	Clark Fork very stony sandy loam, gently sloping and sloping
C2n	Clark Fork very stony sandy loam, strongly sloping
C2o	Como gravelly coarse sandy loam, gently sloping
C2p	Como gravelly coarse sandy loam, sloping
C2r	Como gravelly coarse sandy loam, strongly sloping
C2s	Como gravelly coarse sandy loam, moderately steep
C2t	Como gravelly coarse sandy loam, steep
C2u	Como coarse sandy loam, gently sloping
C2v	Como coarse sandy loam, sloping
C2w	Como coarse sandy loam, strongly sloping
C2x	Como coarse sandy loam, moderately steep
C2y	Como stony coarse sandy loam, gently sloping
C2z	Como stony coarse sandy loam, sloping
C3a	Como stony coarse sandy loam, strongly sloping
C3b	Como stony coarse sandy loam, moderately steep
C3c	Como stony and very stony coarse sandy loams, gently sloping
C3d	Como stony and very stony coarse sandy loams, sloping
C3e	Como stony and very stony coarse sandy loams, strongly sloping
C3f	Como stony and very stony coarse sandy loams, moderately steep
C3g	Como stony and very stony coarse sandy loams, steep
C3h	Cooney loam, sloping
C3k	Cooney loam, strongly sloping
C3l	Cooney loam, moderately steep
C3m	Cooney-Haccke silt loams, sloping
C3n	Cooney-Haccke silt loams, strongly sloping
C3o	Cooney-Haccke silt loams, moderately steep
C3p	Corvallis silt loam
C3r	Corvallis silt loam, poorly drained variant
C3s	Corvallis silt loam, slightly saline
C3t	Corvallis silt loam, moderately saline
C3u	Corvallis silt loam, cobbly subsoil
C3v	Corvallis silt loam, moderately shallow, slightly saline
Da	Dominic cobbly loam, level
Db	Dominic cobbly loam, gently sloping
Dc	Dominic gravelly loamy sand, level
Dd	Dominic gravelly loamy sand, gently sloping
De	Dominic very cobbly sandy loam, level
Df	Dominic very cobbly sandy loam, gently sloping
Ga	Gallatin loam, drained, level
Gb	Gallatin loam, drained, gently sloping
Gc	Gallatin loam-gravelly loam, level
Gd	Gallatin silt loam, level
Ge	Gallatin silt loam, gently sloping
Gf	Gallatin silty clay loam, level
Gh	Gallatin-shallow muck complex, level
Gk	Gallatin-shallow muck complex, gently sloping
Gl	Gird fine sandy loam, sandy subsoil variant, gently sloping
Gm	Gird fine sandy loam, sandy subsoil variant, strongly sloping
Gn	Gird fine sandy loam, sandy subsoil variant, moderately steep and steep
Go	Gird silt loam, gently sloping
Gp	Gird silt loam, strongly sloping
Gr	Gird silt loam, moderately steep
Gs	Gird silt loam, steep
Gt	Gird silt loam, high lime subsoil variant, gently sloping
Gu	Gird silt loam, high lime subsoil variant, sloping
Gv	Gird silt loam, high lime subsoil variant, strongly sloping
Gw	Gird silt loam, high lime subsoil variant, moderately steep
Gx	Gird silt loam, high lime subsoil variant, steep
Gy	Gird-Haccke silt loams, sloping
Gz	Gird-Haccke silt loams, strongly sloping
G2a	Gird-Haccke silt loams, moderately steep
G2b	Gird-Haccke silt loams, steep
G2c	Gird-Teton-Haccke loams, strongly sloping
G2d	Gird-Teton-Haccke loams, moderately steep
G2e	Gird-Teton-Haccke loams, steep
G2f	Gorus silt loam, gently sloping
G2g	Gorus silt loam, sloping
G2h	Gorus silt loam, strongly sloping
G2k	Gorus silt loam, moderately steep
G2l	Grantsdale cobbly loam, imperfectly drained variant, level
G2m	Grantsdale cobbly loam, imperfectly drained variant, slightly saline, level
G2n	Grantsdale loam, level
G2o	Grantsdale loam, gently sloping
G2p	Grantsdale loam, shallow, and Dominic sandy loam, level
G2r	Grantsdale loam, shallow, and Dominic sandy loam, gently sloping
G2s	Grantsdale-Dominic cobbly loams, level
G2t	Grantsdale-Dominic cobbly loams, gently sloping
G2u	Grantsdale and Dominic soils, very shallow, strongly sloping
G2v	Gravel pits and dumps
G2w	Greeley sandy loam, level
G2x	Greeley sandy loam, gently sloping
G2y	Greeley sandy loam, sloping
Ha	Hamilton fine sandy loam, level
Hb	Hamilton fine sandy loam, gently sloping
Hc	Hamilton silt loam, level
Hd	Hamilton silt loam, gently sloping
He	Hamilton-Corvallis sandy loams, level
Hf	Hamilton-Corvallis silt loams, level
Hg	Holloway association, mountainous
Ka	Kenspur fine sandy loam
La	Laporte stony loam, sloping and strongly sloping
Lb	Laporte stony loam, moderately steep and steep
Lc	Larry clay loam, level
Ld	Larry clay loam, drained, level
Le	Larry clay loam, drained, gently sloping
Lf	Larry clay loam, gently sloping
Lg	Larry clay loam, sloping
Lh	Larry silt loam, level
Lk	Larry silt loam, drained, level
Ll	Larry silt loam, gently sloping
Lm	Larry silt loam, drained, gently sloping
Ln	Larry silt loam, sloping
Lo	Lick gravelly loam, gently sloping
Lp	Lick gravelly loam, sloping
Lr	Lick gravelly loam, strongly sloping
Ls	Lick gravelly loam, moderately steep
Lt	Lick loam, imperfectly drained variant, level
Lu	Lick loam, gently sloping
Lv	Lick loam, imperfectly drained variant, gently sloping
Lw	Lick loam, sloping
Lx	Lick loam, strongly sloping
Ly	Lick loam, moderately steep
Lz	Lick loam, imperfectly drained variant, sloping
L2a	Lick loam, imperfectly drained variant, strongly sloping
L2b	Lick stony loam, sloping
L2c	Lick stony loam, strongly sloping
L2d	Lick stony loam, moderately steep
L2e	Lick stony loam, steep
L2f	Lolo cobbly loam, gently sloping
L2g	Lolo gravelly loam, level
L2h	Lolo gravelly loam, gently sloping
L2k	Lone Rock cobbly coarse sandy loam, level
L2l	Lone Rock fine sandy loam, dark colored variant, level
L2m	Lone Rock coarse sandy loam, level
L2n	Lone Rock coarse sandy loam, gently sloping
L2o	Lone Rock coarse sandy loam, sloping
Ma	Maiden-Gird silt loams, gently sloping
Mb	Maiden-Gird silt loams, sloping
Mc	Maiden-Gird silt loams, strongly sloping
Md	Maiden-Gird silt loams, moderately steep
Pa	Peat
Pb	Peat, shallow over silt
Pc	Peat, shallow over gravel
Pd	Poverty cobbly loam, level
Pe	Poverty cobbly loam, gently sloping
Pf	Poverty cobbly loam, sloping
Pg	Poverty loam, gently sloping
Ph	Poverty coarse sandy loam, level
Pk	Poverty coarse sandy loam, gently sloping
Pl	Poverty coarse sandy loam, sloping
Pm	Poverty very stony coarse sandy loam, gently sloping
Pn	Poverty very stony coarse sandy loam, sloping
Ra	Ravalli-Bitterroot cobbly loams, shallow, gently sloping
Rb	Ravalli-Bitterroot cobbly loams, shallow, sloping
Rc	Ravalli-Bitterroot cobbly loams, shallow, strongly sloping
Rd	Ravalli-Bitterroot loams, shallow, gently sloping
Re	Ravalli-Bitterroot loams, shallow, sloping
Rf	Ravalli-Bitterroot loams, shallow, strongly sloping
Rg	Riverside cobbly loam, gently sloping
Rh	Riverside cobbly loam, sloping
Rk	Riverside cobbly sandy loam, gently sloping
Rl	Riverside cobbly sandy loam, sloping
Rm	Riverside fine sandy loam, gently sloping
Rn	Riverside fine sandy loam, sloping
Ro	Riverside fine sandy loam, strongly sloping
Rp	Riverside gravelly and cobbly sandy loams, strongly sloping
Rr	Riverside gravelly sandy loam, gently sloping
Rs	Riverside gravelly sandy loam, sloping
Rt	Riverside loam, level
Ru	Riverside loam, gently sloping
Rv	Riverside loam, sloping
Rw	Riverside loam, strongly sloping
Rx	Riverside soils, moderately steep and steep
Ry	Riverwash
Sa	St. Joe loam and clay loam, level
Sb	St. Joe loam and clay loam, gently sloping
Sc	St. Joe loam and clay loam, sloping
Sd	St. Joe loam and clay loam, drained, level
Se	St. Joe loam and clay loam, drained, gently sloping
Sf	Shook coarse sandy loam, sloping
Sg	Shook coarse sandy loam, strongly sloping
Sh	Shook coarse sandy loam, moderately steep
Sk	Skaggs silt loam, sloping
Sl	Skaggs silt loam, strongly sloping
Sm	Skaggs silt loam, moderately steep
Sn	Skaggs silt loam, steep
So	Skaggs-Sogn association, mountainous
Sp	Skalkaho gravelly loam, gently sloping
Sr	Skalkaho gravelly coarse sandy loam, micaceous variant, gently sloping
Ss	Skalkaho gravelly loam, sloping
St	Skalkaho gravelly coarse sandy loam, micaceous variant, sloping
Su	Skalkaho gravelly loam, strongly sloping
Sv	Skalkaho gravelly coarse sandy loam, micaceous variant. strongly sloping
Sw	Skalkaho gravelly loam, moderately steep
Sx	Skalkaho gravelly coarse sandy loam, micaceous variant, moderately steep
Sy	Skalkaho-Ravalli loams, gently sloping
Sz	Skalkaho-Ravalli loams, sloping
S2a	Skalkaho-Ravalli loams, strongly sloping
S2b	Skalkaho-Ravalli loams, moderately steep
S2c	Skalkaho-Ravalli stony loams, sloping and strongly sloping
S2d	Skalkaho-Ravalli stony loams, moderately steep and steep
S2e	Slocum complex, shallow, slightly saline
S2f	Slocum complex, shallow, moderately saline
S2g	Slocum loam
S2h	Slocum loam, deep
S2k	Slocum loam, slightly saline
S2l	Slocum loam, poorly drained variant
S2m	Slocum sandy loam-gravelly sandy loam, shallow
S2n	Slocum-shallow muck complex
S2o	Sogn-Skaggs loams and stony loams, strongly sloping
S2p	Sogn-Skaggs loams and stony loams, moderately steep
S2r	Stecum coarse sandy loam, gently sloping
S2s	Stecum coarse sandy loam, sloping
S2t	Stecum coarse sandy loam, strongly sloping
S2u	Stecum stony loamy coarse sand, sloping
S2v	Stecum stony loamy coarse sand, strongly sloping
S2w	Stecum stony loamy coarse sand, moderately steep and steep
S2x	Sula loam variant-Ravalli loam, gently sloping and sloping
S2y	Sula loam variant-Ravalli loam, strongly sloping
S2z	Sulu loam variant-Ravalli loam, moderately steep and steep
S3a	Sula silt loam, level
S3b	Sula silt loam, gently sloping
S3c	Sula silt loam, sloping
S3d	Sula silt loam, strongly sloping
S3e	Sula-Haccke silt loams, sloping
S3f	Sula-Haccke silt loams, strongly sloping
Ta	Teton-Cheadle association, mountainous
Tb	Trapper association, mountainous
Va	Victor cobbly coarse sandy loam, gently sloping and sloping
Vb	Victor gravelly coarse sandy loam, level
Vc	Victor gravelly coarse sandy loam, gently sloping
Vd	Victor loam, level
Ve	Victor loam, gently sloping
Vf	Victor loam, calcareous variant, level
Vg	Victor loam, calcareous variant, gently sloping
Vh	Victor loam, imperfectly drained (seeped), level
Vk	Victor gravelly coarse sandy loam, sloping and strongly sloping
Vl	Victor-St. Joe cobbly loams, gently sloping
Wa	Wemple-Bitterroot-Ravalli complex, level
Wb	Wemple-Bitterroot-Ravalli complex, gently sloping
Wc	Wemple-Bitterroot-Ravalli complex, sloping
Wd	Wemple-Bitterroot-Ravalli complex, strongly sloping
We	Willoughby loam, level
Wf	Willoughby loam, gently sloping
Wg	Willoughby loam, sloping
Wh	Woodrock association, mountainous
Wk	Woodside sandy loam, gently sloping
Wl	Woodside sandy loam, sloping
Wm	Woodside sandy loam, strongly sloping
Wn	Woodside sandy loam, moderately steep
Wo	Woodside stony sandy loam, gently sloping
Wp	Woodside stony sandy loam, sloping
Wr	Woodside stony sandy loam, strongly sloping
Ws	Woodside stony sandy loam, moderately steep
Wt	Woodside very stony sandy loam, gently sloping
Wu	Woodside very stony sandy loam, sloping
Wv	Woodside very stony sandy loam, strongly sloping
Ww	Woodside very stony sandy loam, moderately steep
Wx	Woodside very stony sandy loam, steep

Soils surveyed 1947-51 by W. C. Bourne, in Charge, Paul Grammons, Gene Doll, and Clarence Pile, Montana Agricultural Experiment Station, and W. H. Gardon, R. C. McConnell, Alex Pope, and William Bullette, U. S. Department of Agriculture.
Correlation by B. H. Williams, U. S. Department of Agriculture.

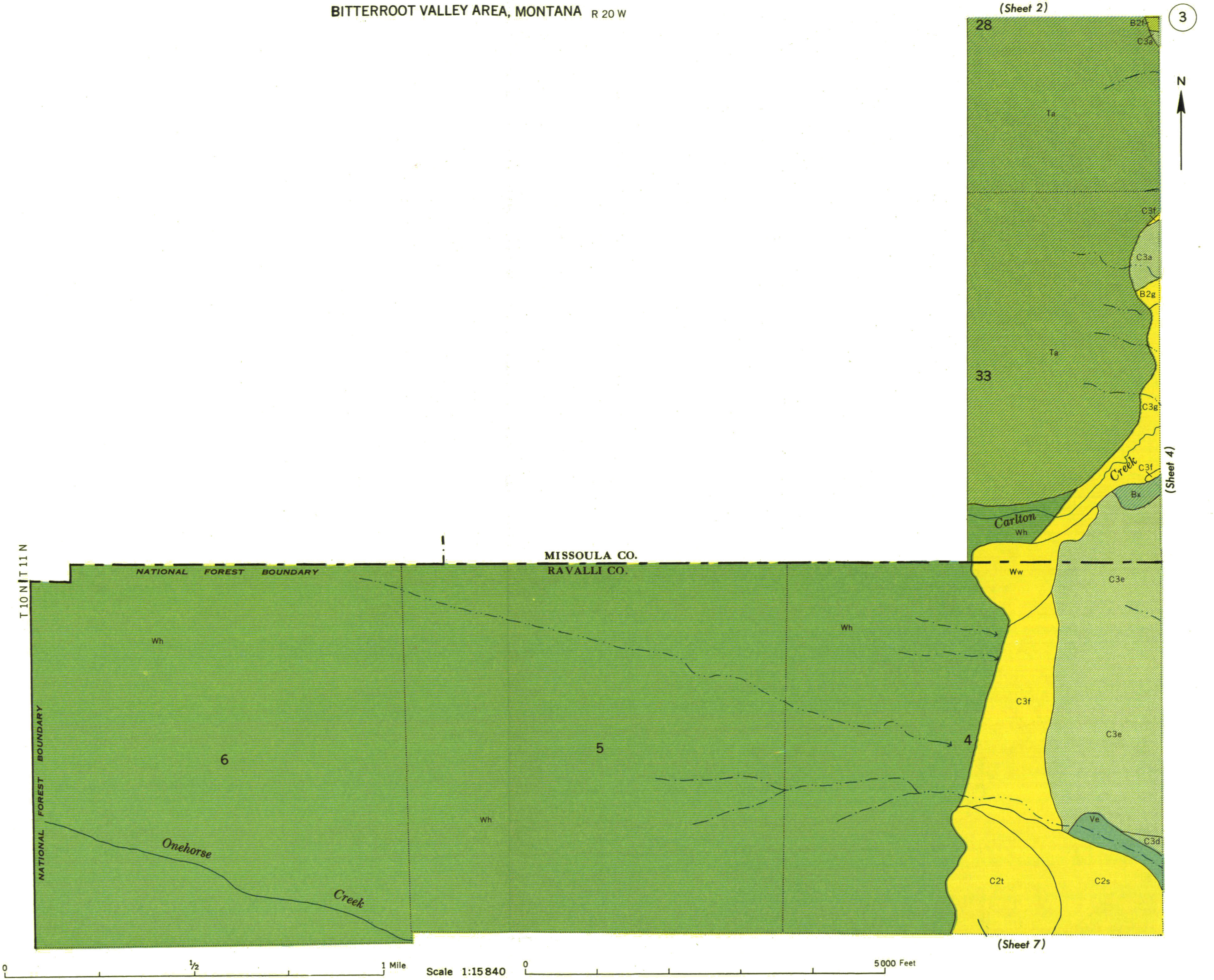
Soil map constructed by Cartographic Division, Soil Conservation Service, USDA, from 1941-42 aerial photographs.
Map based on polyconic projection, 1927 North American datum.


N
Lolo Creek
Mormon Creek
Creek
BITTERROOT RIVER
NORTHERN PACIFIC
93
34
35
1
2
3
7
9
10
11
12
T 11 N
(Sheet 2)
R 20 W
R 19 W
0
1/2
1 Mile
Scale 1:15840
0
5000 Feet

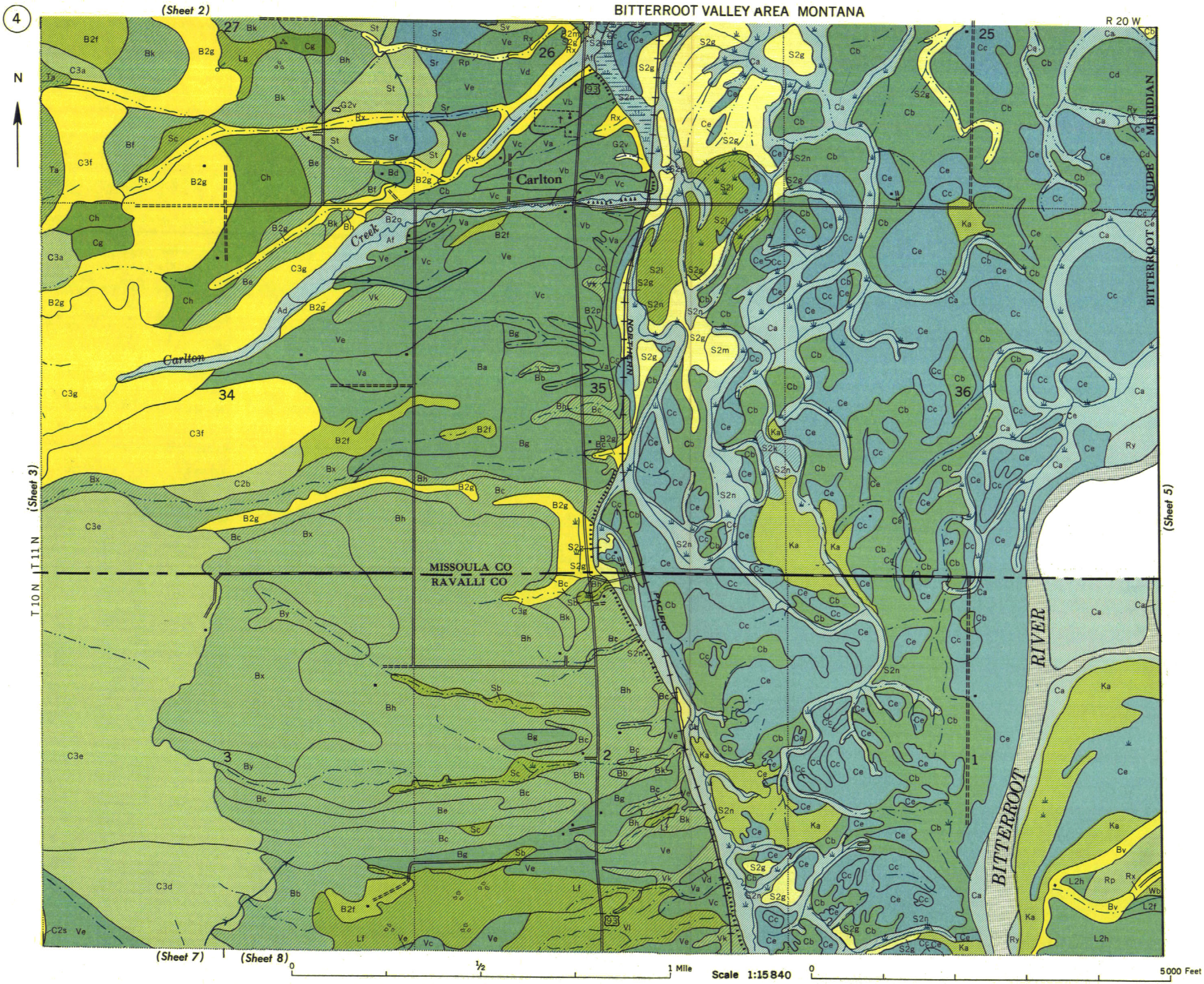


(Sheet 3) | (Sheet 4)
(Sheet 4) | (Sheet 5)

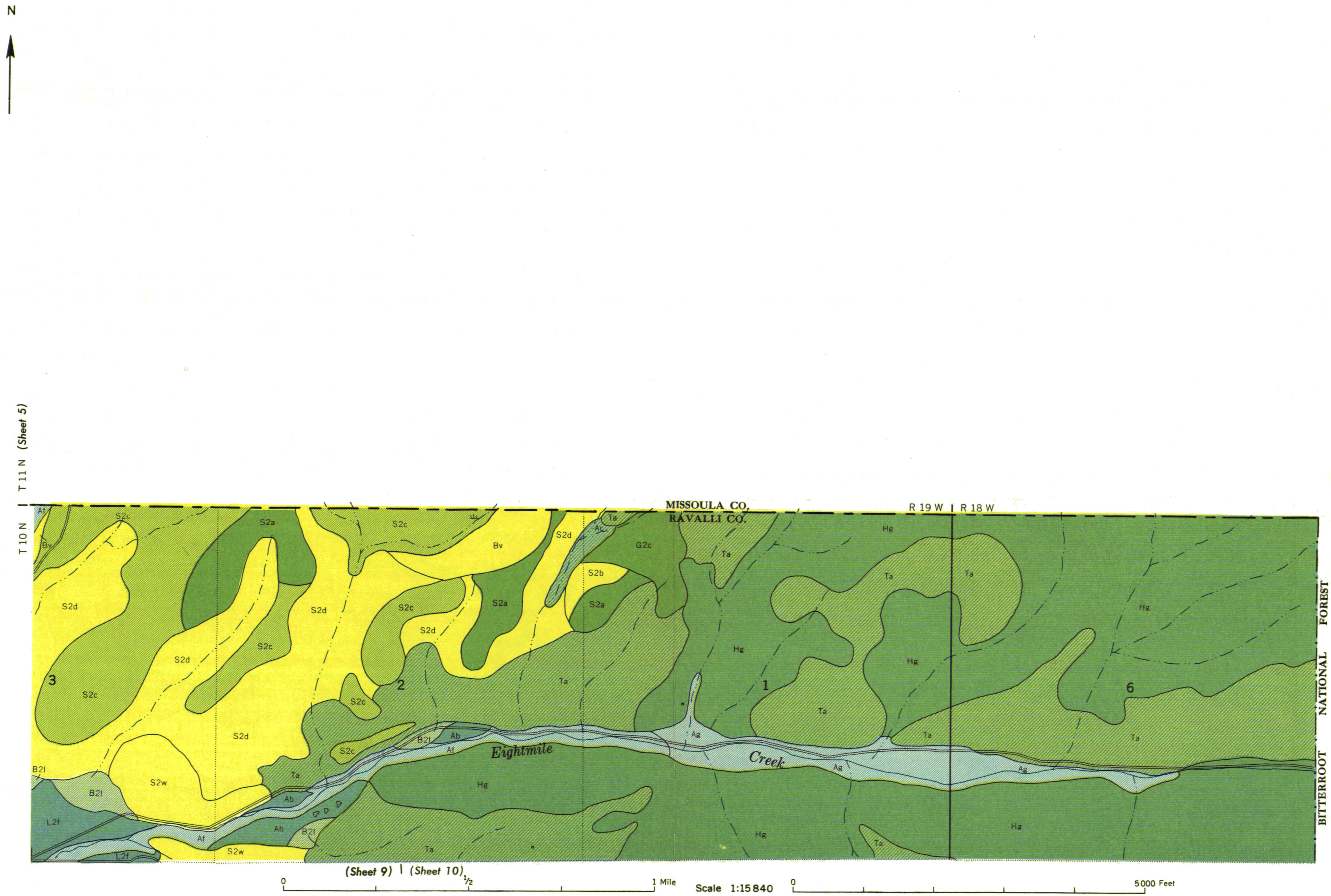
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

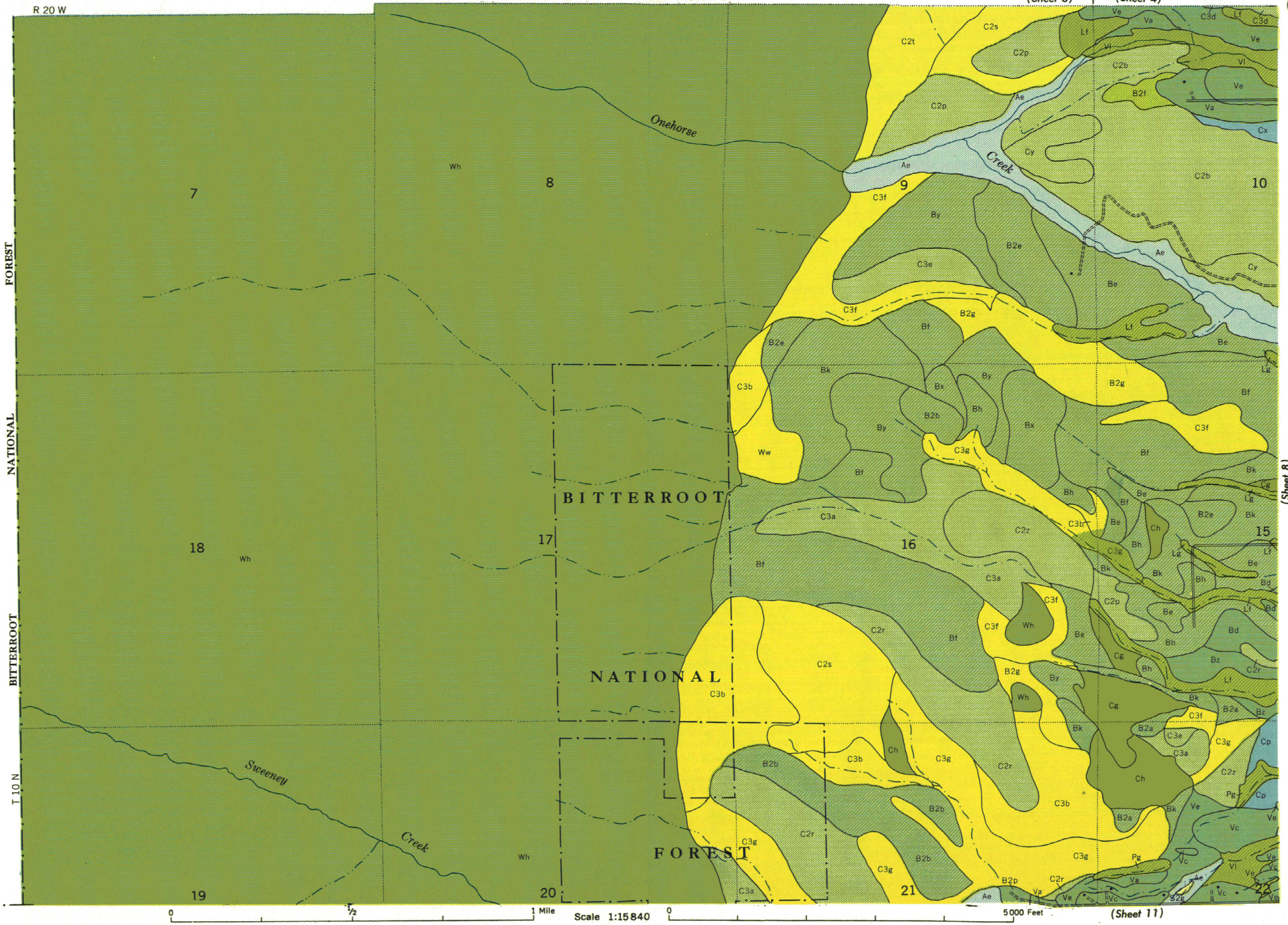

R 20 W
(Sheet 2)
28
B2f
C3a
N
Ta
C3f
C3a
B2g
Ta
33
C3g
Creek
C3f
(Sheet 4)
Bx
Carlton
Wh
MISSOULA CO.
RAVALLI CO.
NATIONAL FOREST BOUNDARY
T 11 N
T 10 N
Ww
C3e
Wh
Wh
C3f
C3e
6
5
4
NATIONAL FOREST BOUNDARY
Wh
Ve
C3d
Onehorse
Creek
C2t
C2s
(Sheet 7)
0
1/2
1 Mile
Scale 1:15840
0
5000 Feet

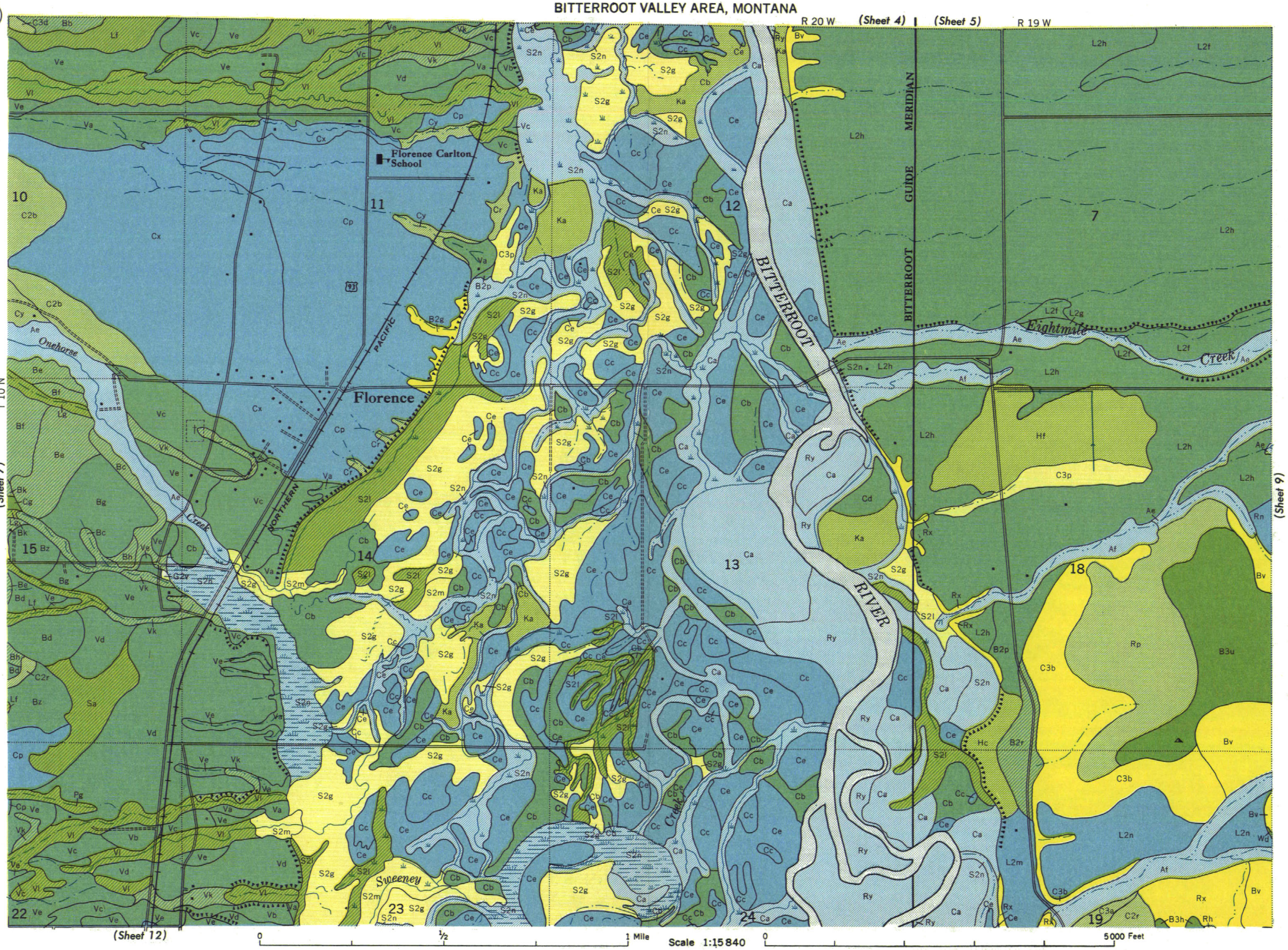
BITTERROOT VALLEY AREA MONTANA

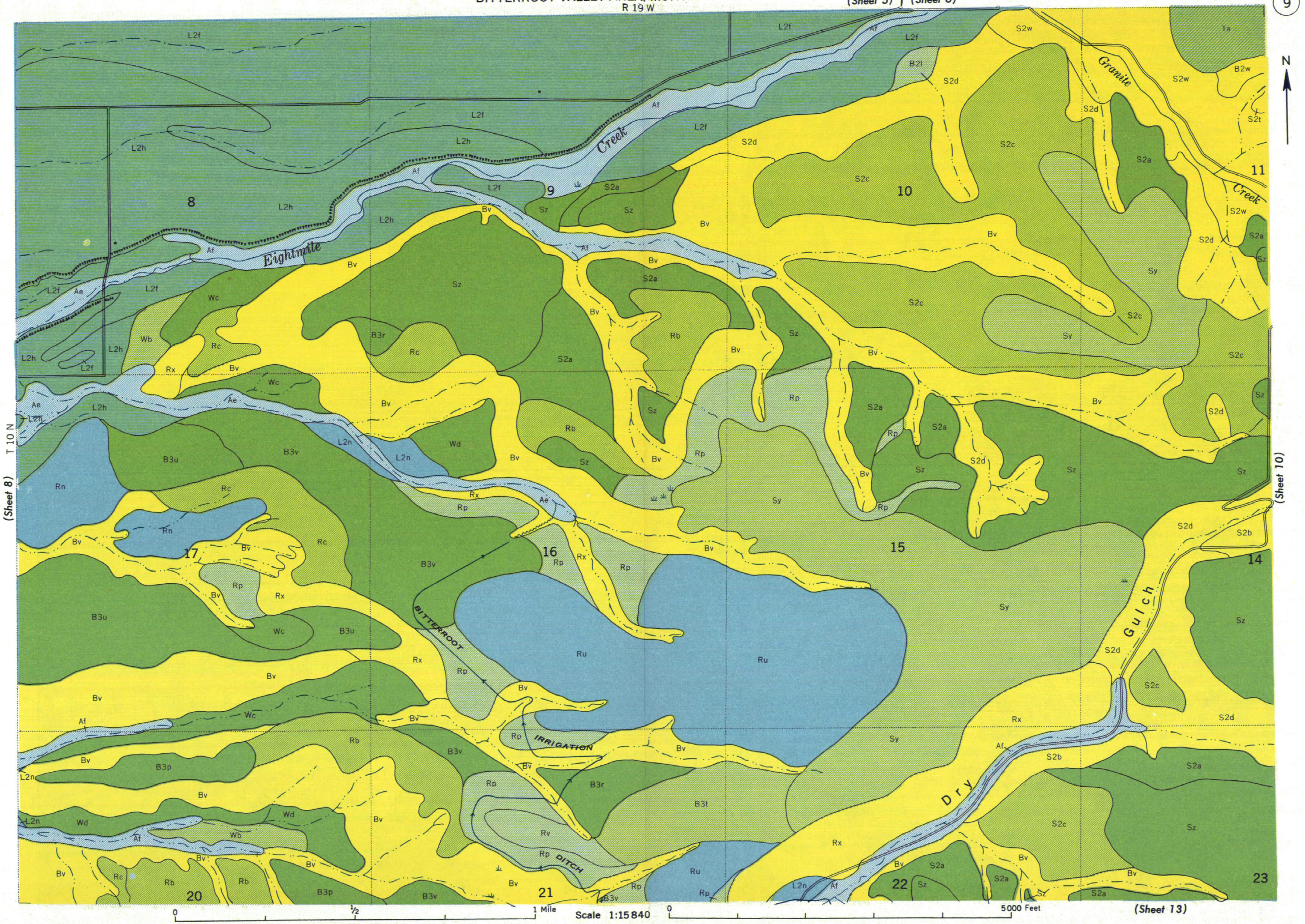


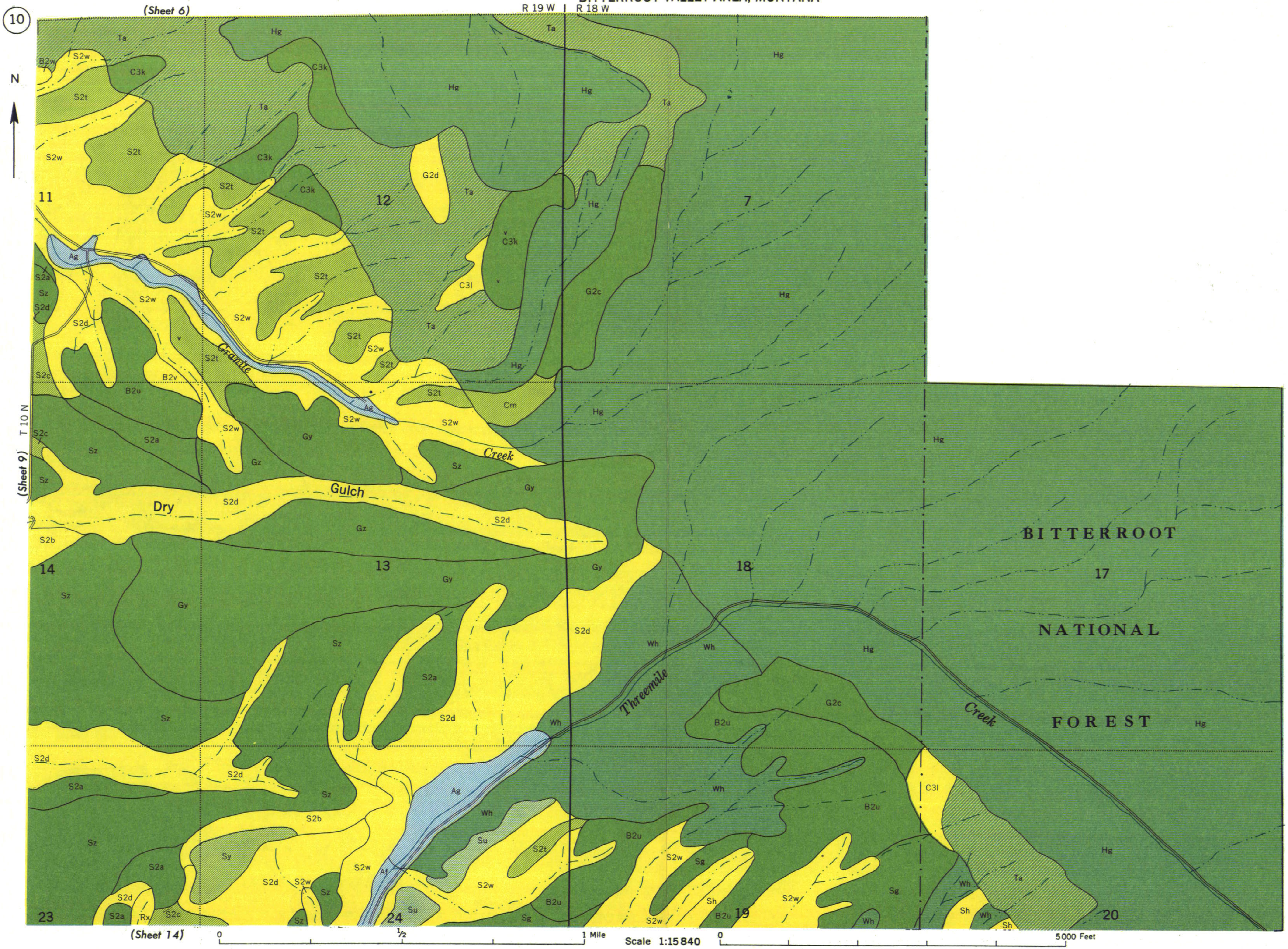

R 19 W
(Sheet 2)
N
(Sheet 4)
T 11 N
T 10 N
(Sheet 6)
MISSOULA CO.
RAVALLI CO.
BITTERROOT GUIDE MERIDIAN
BITTERROOT RIVER
Woodchuck Creek
30
31
6
5
4
3
(Sheet 8)
(Sheet 9)
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

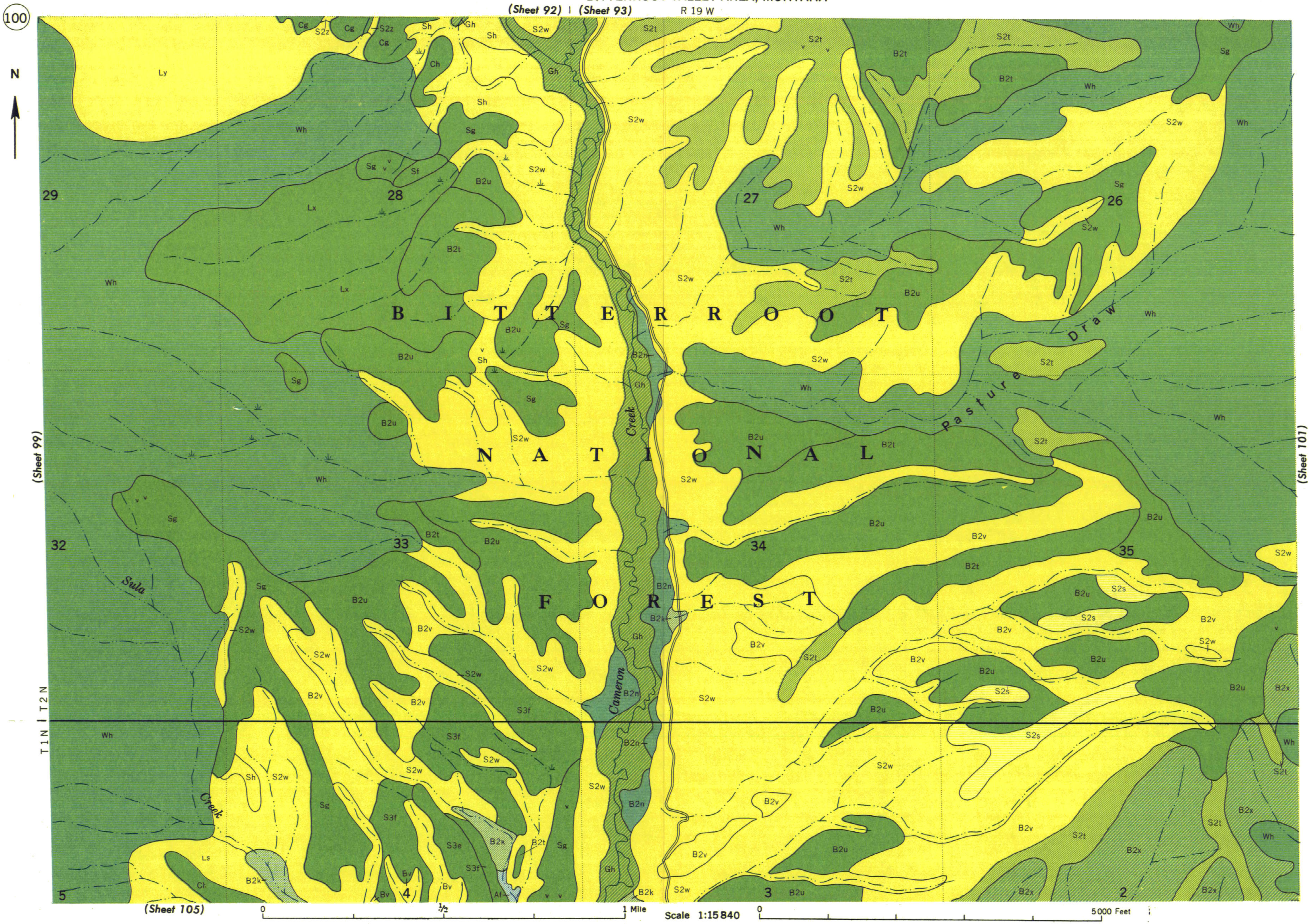

N
T 11 N (Sheet 5)
T 10 N
MISSOULA CO.
RAVALLI CO.
R 19 W
R 18 W
BITTERROOT NATIONAL FOREST
Eightmile
Creek
3
2
1
6
Af
Bv
S2c
S2a
S2d
S2b
Ta
Ac
G2c
Hg
Ag
Ab
B2l
L2f
S2w
(Sheet 9)
(Sheet 10)
0
1/2
1 Mile
Scale 1:15840
0
5000 Feet


(Sheet 3)
(Sheet 4)
N
R 20 W
FOREST
NATIONAL
BITTERROOT
T 10 N
Onehorse
Creek
Sweeney
Creek
BITTERROOT
NATIONAL
FOREST
7
8
9
10
15
16
17
18
19
20
21
22
Wh
Ae
Ww
C2t
C2s
C2p
C2b
C2r
C2z
C3f
C3e
C3b
C3g
C3a
C3d
B2e
B2g
B2f
B2b
B2a
B2p
By
Bf
Bk
Bx
Bh
Be
Bd
Bz
Cy
Cx
Cg
Ch
Cp
Lf
Lg
Vl
Ve
Va
Vc
Pg
(Sheet 8)
(Sheet 11)
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet

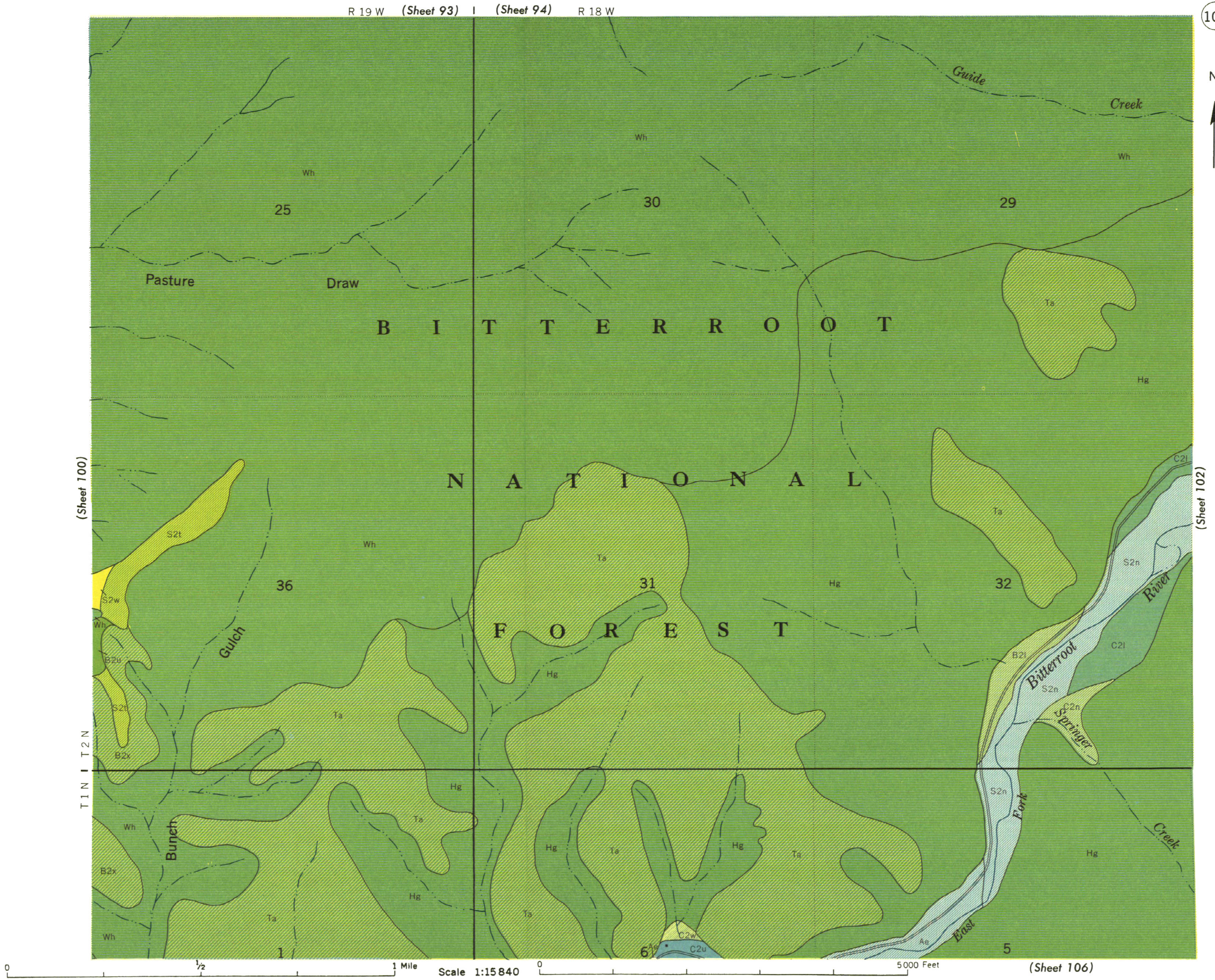

N
R 20 W
(Sheet 4)
(Sheet 5)
R 19 W
Florence Carlton School
Florence
PACIFIC
NORTHERN
93
BITTERROOT
RIVER
BITTERROOT GUIDE MERIDIAN
Onehorse
Creek
Eightmile
Creek
Sweeney
Creek
T 10 N
(Sheet 7)
(Sheet 9)
(Sheet 12)
10
11
12
7
13
14
15
18
19
22
23
24
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet

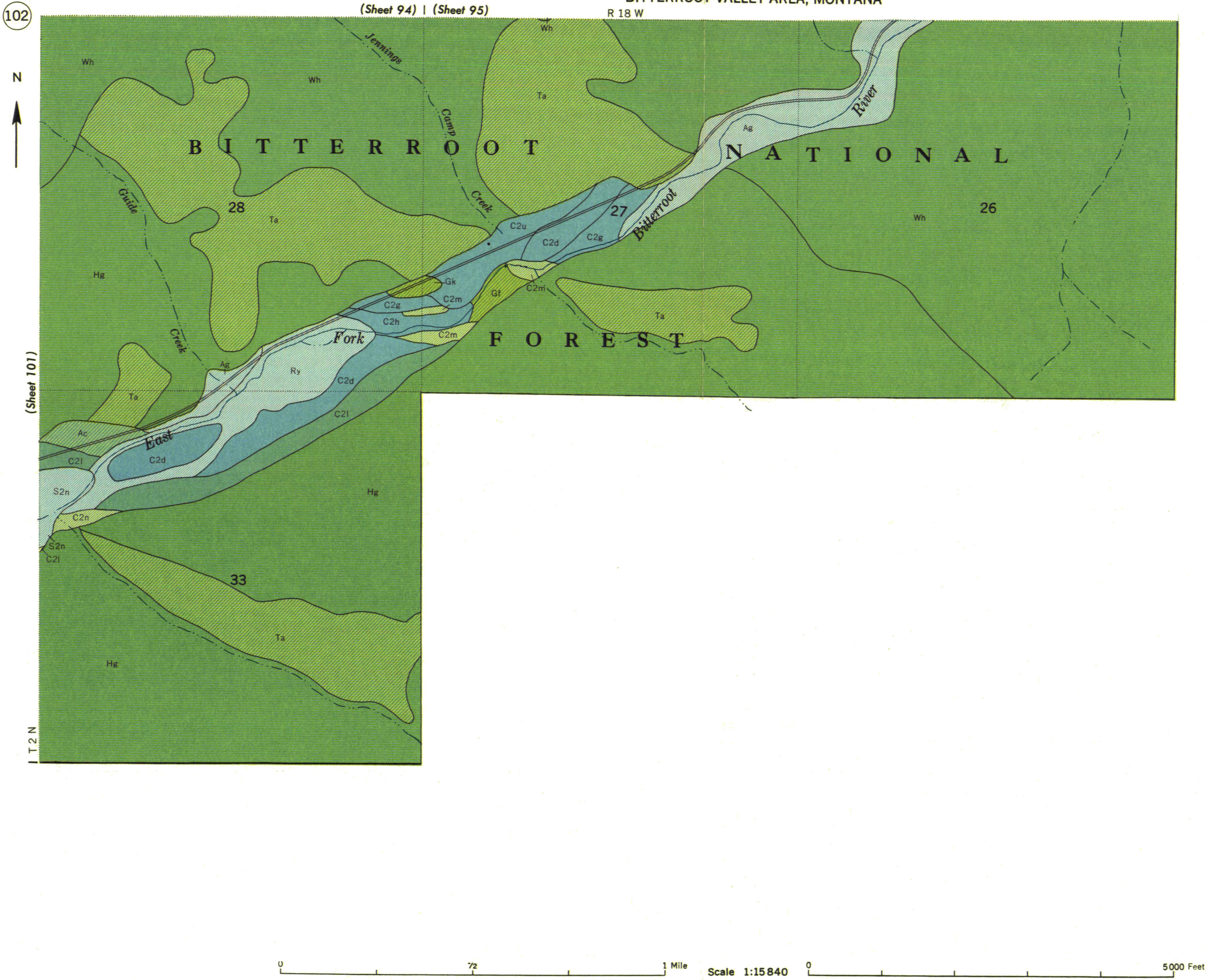

R 19 W
(Sheet 5)
(Sheet 6)
(Sheet 8)
(Sheet 10)
(Sheet 13)
T 10 N
N
Eightmile Creek
Granite Creek
Dry Gulch
BITTERROOT IRRIGATION DITCH
8
9
10
11
14
15
16
17
20
21
22
23
Scale 1:15 840
0
1/2
1 Mile
0
5000 Feet

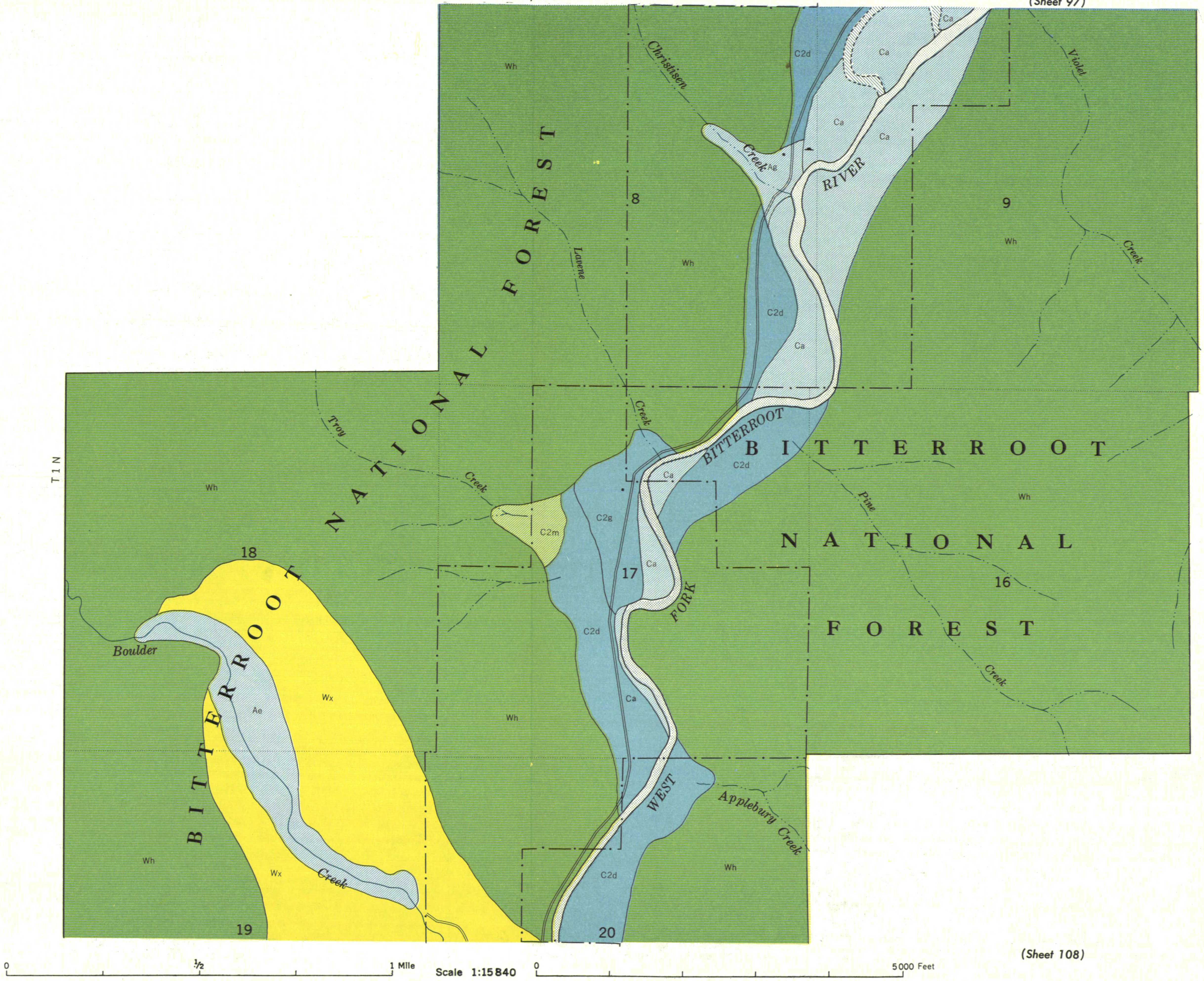

(Sheet 6)
R 19 W
R 18 W
N
T 10 N
(Sheet 9)
(Sheet 14)
11
12
7
14
13
18
17
23
24
19
20
Granite
Creek
Dry
Gulch
Threemile
Creek
BITTERROOT
NATIONAL
FOREST
Ta
Hg
B2w
S2w
C3k
S2t
G2d
C3l
G2c
Ag
S2a
Sz
S2d
B2v
B2u
S2c
Cm
Gy
Gz
S2b
Wh
Af
Su
Sy
Rx
Sg
Sh
Scale 1:15 840
0
½
1 Mile
0
5000 Feet

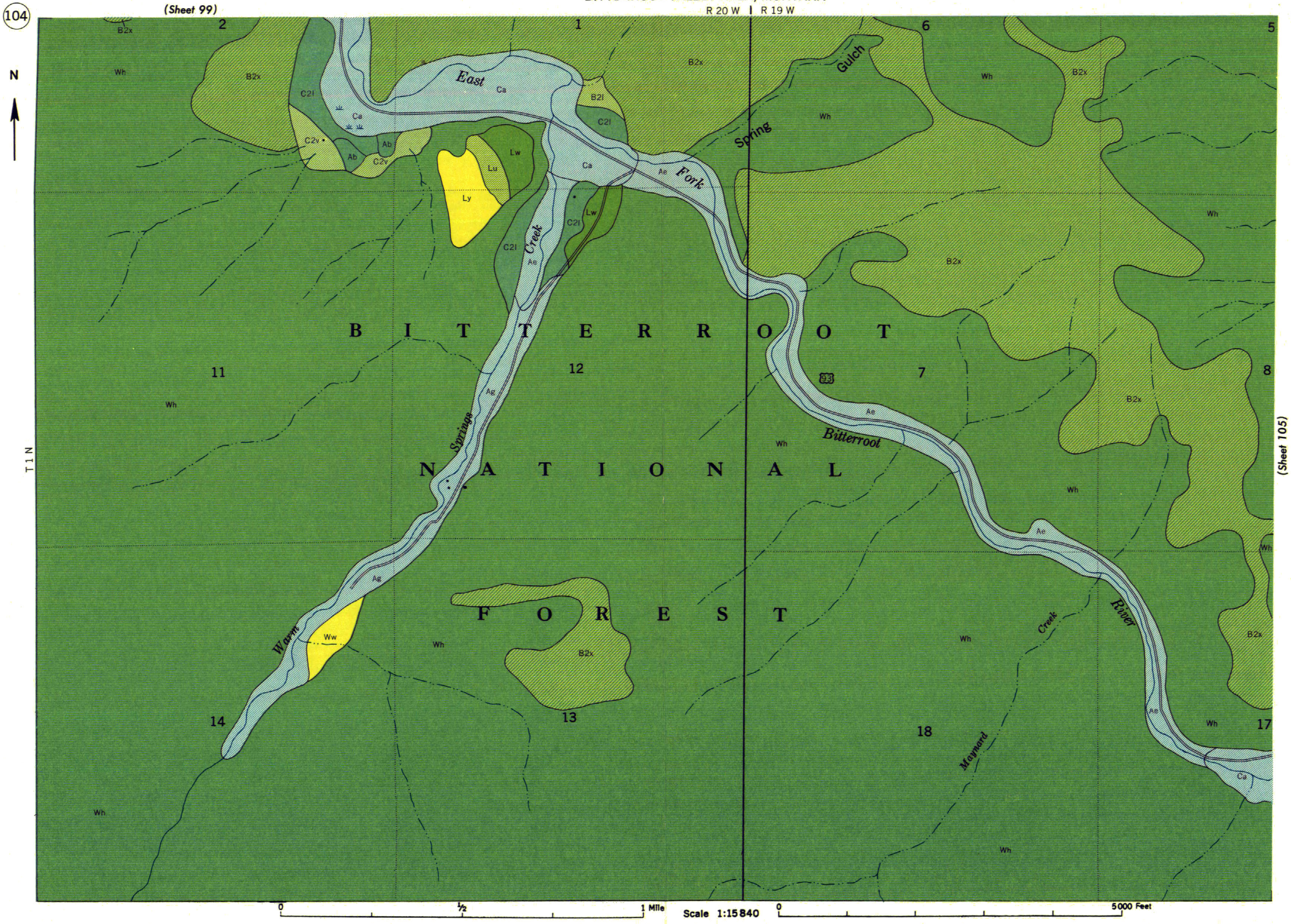


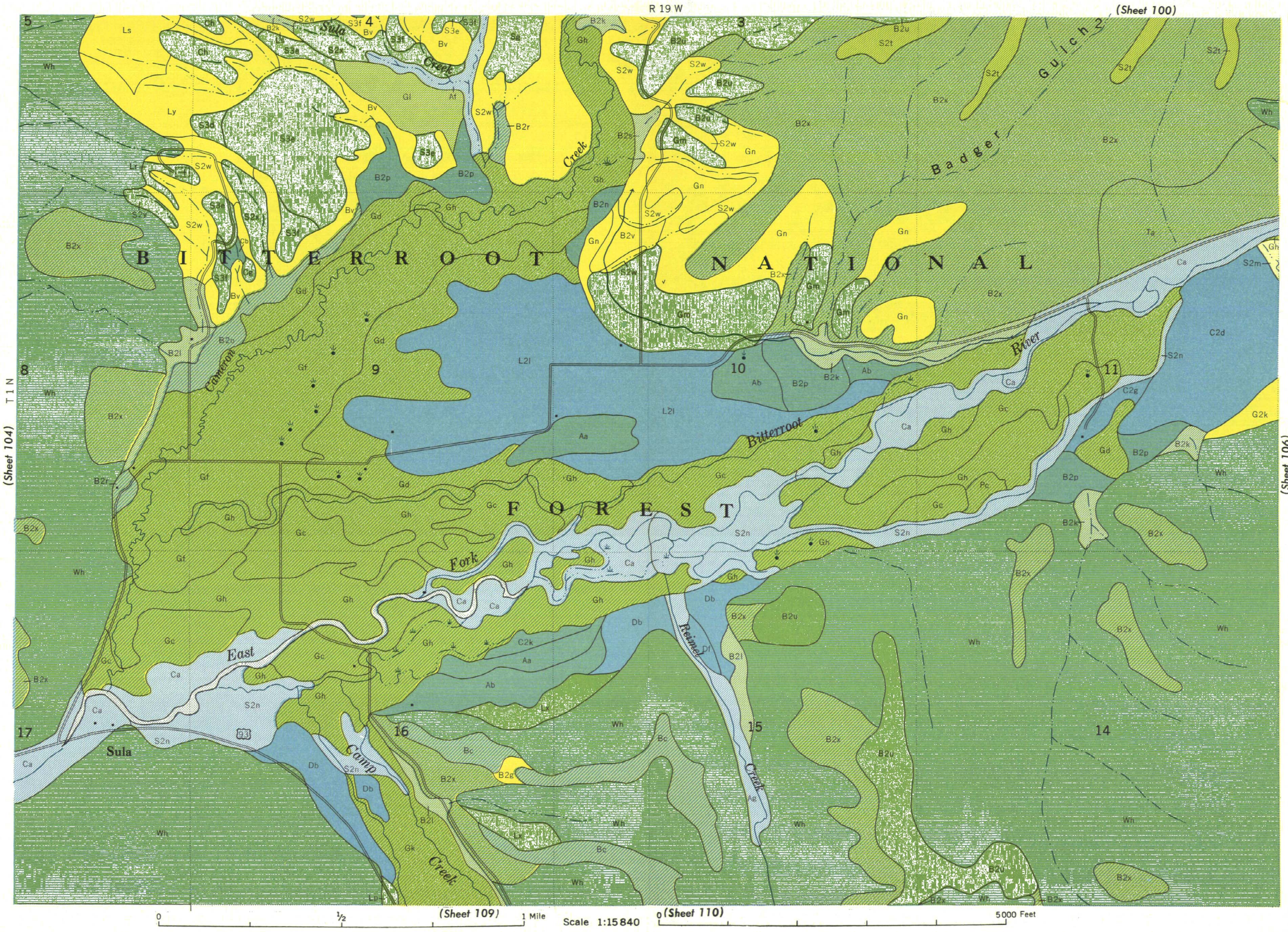
(Sheet 92)
(Sheet 93)
R 19 W
N
(Sheet 99)
(Sheet 101)
(Sheet 105)
T2N
T1N
29
28
27
26
32
33
34
35
5
4
3
2
B I T T E R R O O T
N A T I O N A L
F O R E S T
Cameron
Creek
Sula
Creek
Pasture Draw
Scale 1:15 840
0
½
1 Mile
0
5000 Feet


R 19 W
(Sheet 93)
(Sheet 94)
R 18 W
N
Guide Creek
Pasture Draw
BITTERROOT NATIONAL FOREST
25
30
29
36
31
32
1
6
5
Wh
Ta
Hg
S2t
S2w
B2u
B2x
B2l
S2n
C2l
C2n
C2w
C2u
Ae
Gulch
Bunch
Bitterroot River
East Fork
Springer
Creek
(Sheet 100)
(Sheet 102)
T 2 N
T 1 N
(Sheet 106)
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet


(Sheet 94) | (Sheet 95)
R 18 W
N
(Sheet 101)
T 2 N
B I T T E R R O O T
N A T I O N A L
F O R E S T
Jennings
Camp
Creek
Guide
Creek
East
Fork
Bitterroot
River
28
27
26
33
Wh
Ta
Hg
Ag
Ac
Ry
Gk
Gf
C2u
C2d
C2g
C2m
C2h
C2l
C2n
S2n
0
½
1 Mile
Scale 1:15 840
0
5000 Feet


R 21 W
T 1 N
N
BITTERROOT NATIONAL FOREST
BITTERROOT NATIONAL FOREST
BITTERROOT RIVER
WEST FORK
Christisen Creek
Lavene Creek
Troy Creek
Violet Creek
Pine Creek
Boulder Creek
Applebury Creek
8
9
16
17
18
19
20
Wh
Wx
Ae
Ag
Ca
C2d
C2g
C2m
0
½
1 Mile
Scale 1:15840
0
5000 Feet

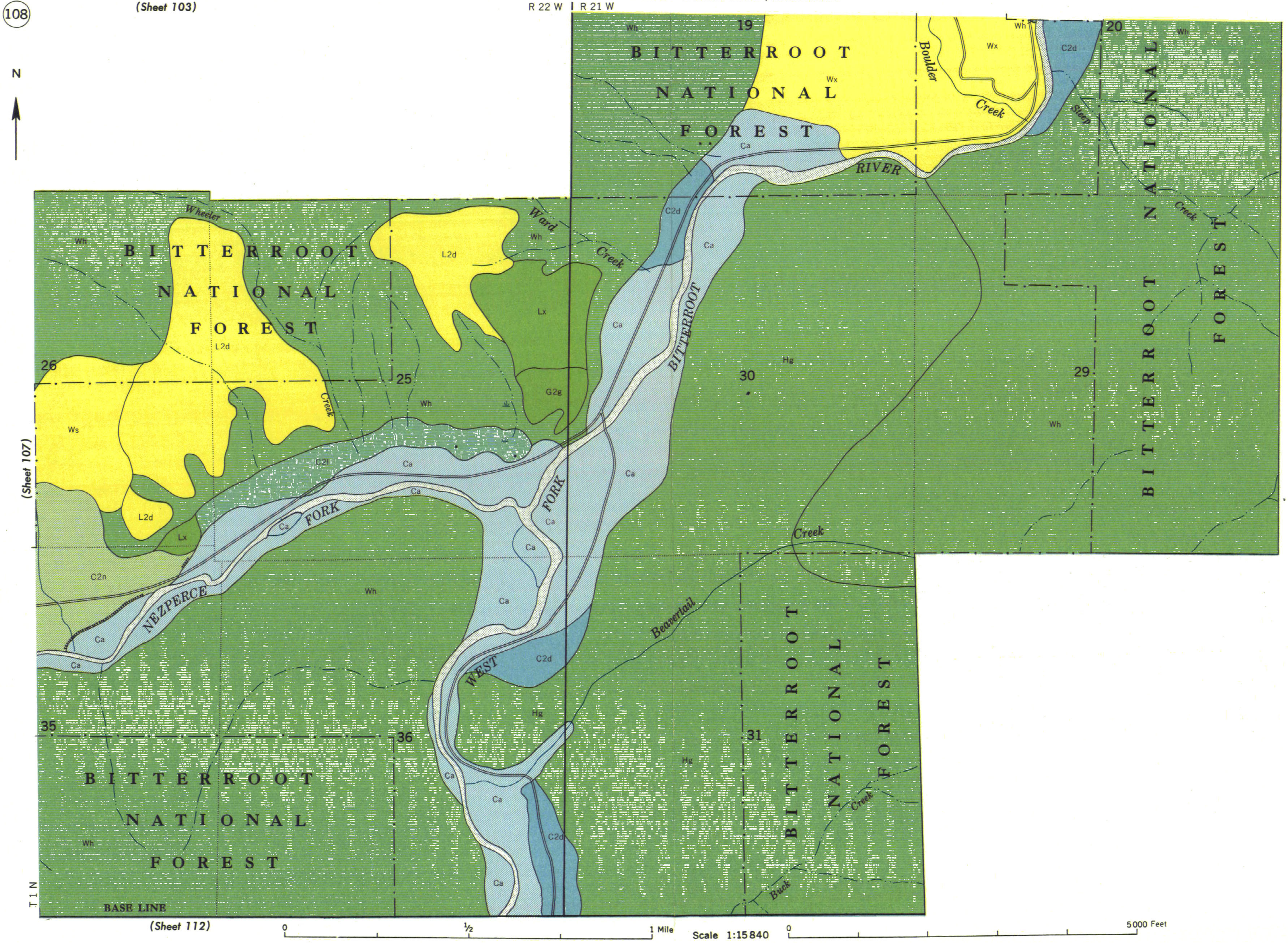

(Sheet 99)
R 20 W
R 19 W
N
(Sheet 105)
T 1 N
B I T T E R R O O T
N A T I O N A L
F O R E S T
East Fork
Spring Gulch
Warm Springs Creek
Bitterroot River
Maynard Creek
93
1
2
5
6
7
8
11
12
13
14
17
18
Wh
B2x
B2l
C2l
C2v
Ca
Ab
Lw
Lu
Ly
Ae
Ag
Ww
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

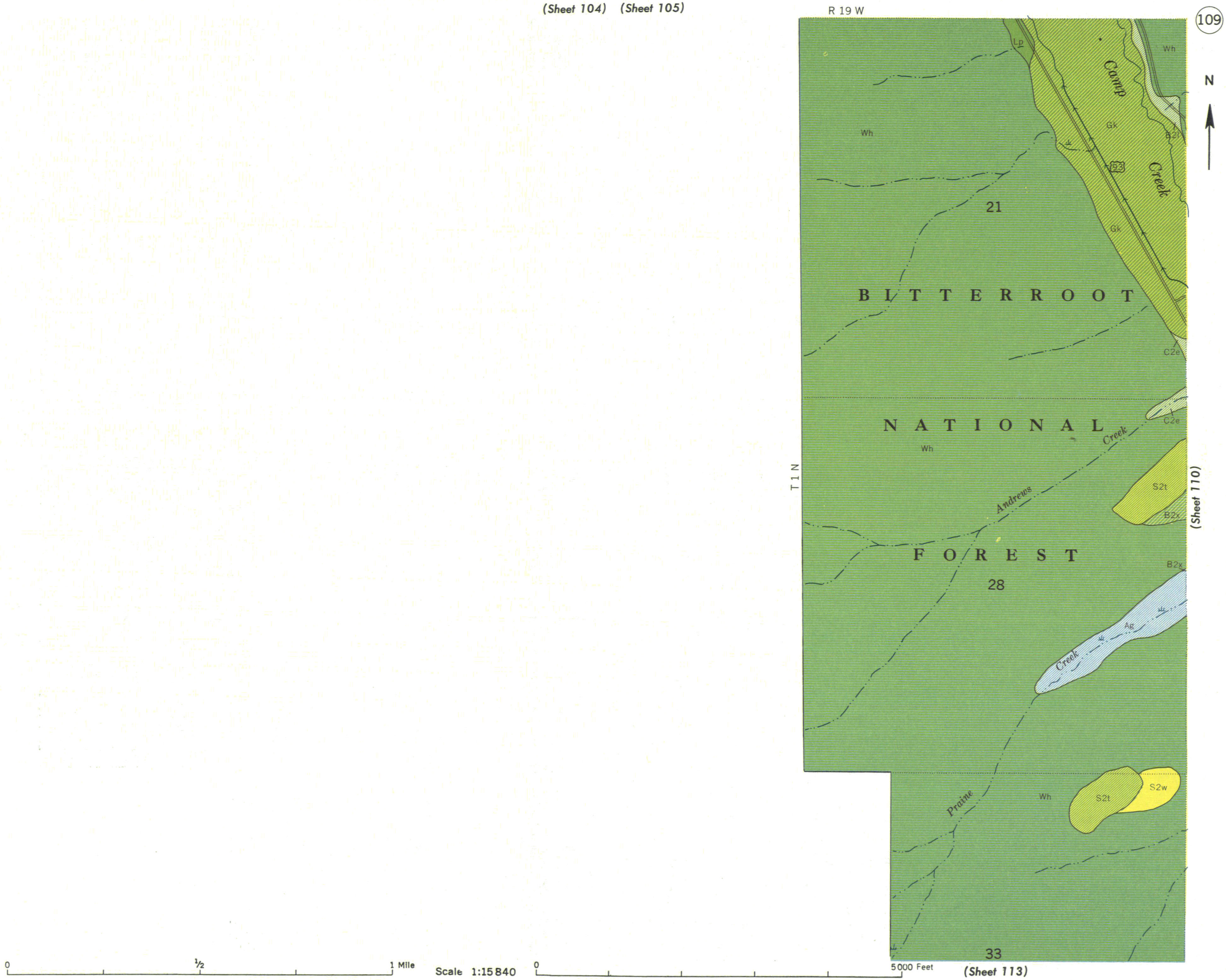

R 19 W
(Sheet 100)
N
T 1 N
(Sheet 104)
(Sheet 106)
B I T T E R R O O T   N A T I O N A L
F O R E S T
Sula Creek
Cameron Creek
Badger Gulch
Bitterroot River
East Fork
Camp Creek
Reimel Creek
Sula
5
4
3
8
9
10
11
17
16
15
14
(Sheet 109)
(Sheet 110)
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet


(Sheet 101)
R 19 W
R 18 W
N
Bunch
Gulch
Bitterroot
River
East
Fork
Mink
Creek
Tolan
Creek
BITTERROOT NATIONAL
FOREST
T 1 N
(Sheet 105)
(Sheet 110)
1
5
6
7
8
12
13
Wh
B2x
B2l
B2k
Ta
Hg
Ce
S2g
Gc
C2k
C2n
Ae
Ca
Gh
C2d
C2l
C2v
C2g
Ac
S2m
G2k
Gk
C2w
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

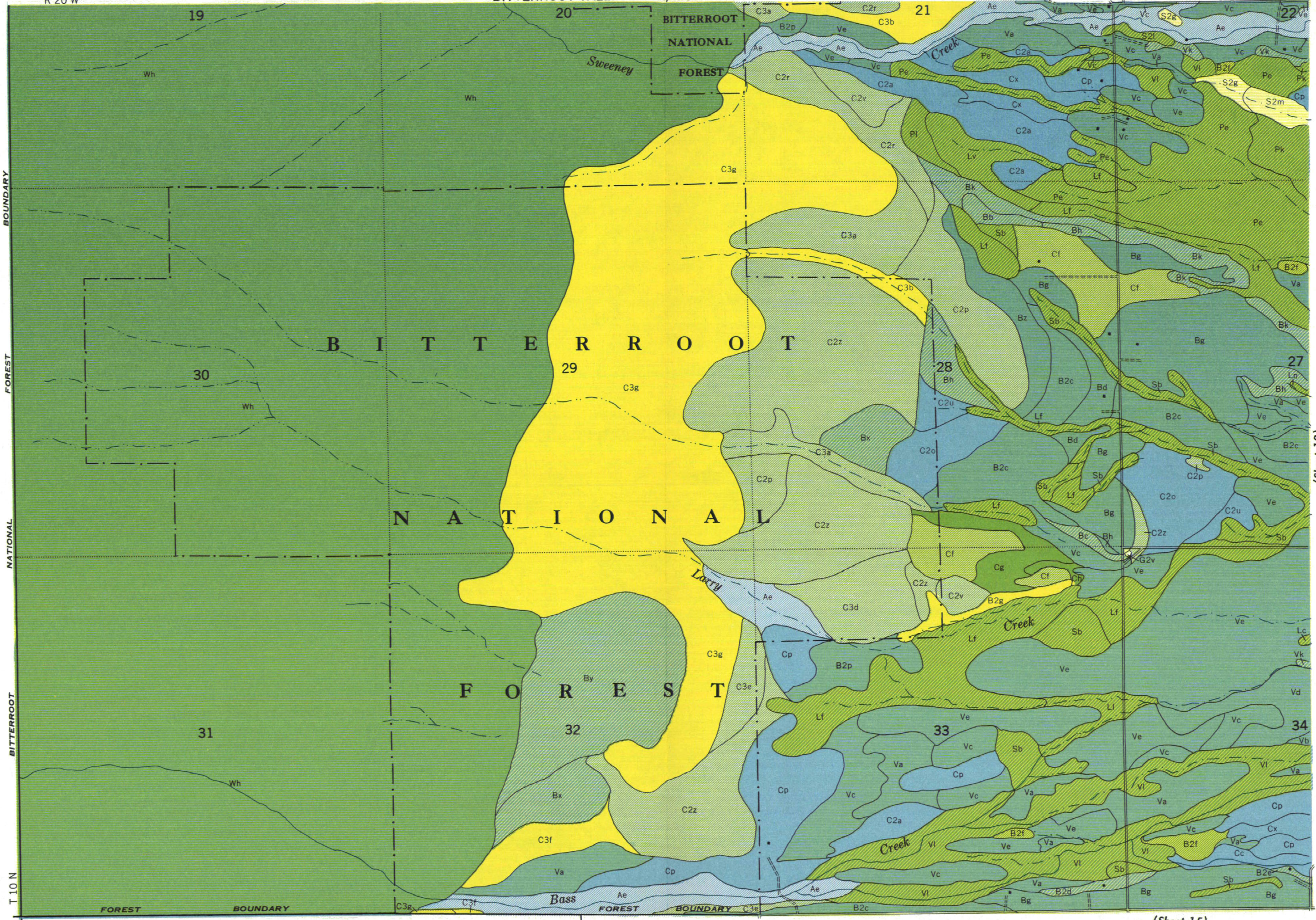
R 22 W

0 ½ 1 Mile Scale 1:15840 0 5000 Feet


(Sheet 103)
N
R 22 W
R 21 W
BITTERROOT NATIONAL FOREST
BITTERROOT NATIONAL FOREST
BITTERROOT NATIONAL FOREST
BITTERROOT NATIONAL FOREST
BITTERROOT NATIONAL FOREST
Boulder Creek
Steep
RIVER
BITTERROOT
Wheeler
Ward Creek
Creek
FORK
WEST
FORK
NEZPERCE
Creek
Beavertail
Creek
Buck
19
20
25
26
29
30
31
35
36
Wh
Wx
C2d
Ca
L2d
Lx
G2g
Ws
G2l
C2n
Hg
(Sheet 107)
T 1 N
BASE LINE
(Sheet 112)
0
½
1 Mile
Scale 1:15 840
0
5000 Feet


(Sheet 104)
(Sheet 105)
R 19 W
109
N
Lp
Wh
Camp
Creek
Gk
B2l
93
21
BITTERROOT
NATIONAL
FOREST
C2e
Creek
Andrews
T 1 N
S2t
B2x
(Sheet 110)
28
Ag
Creek
Prairie
S2w
33
0
½
1 Mile
Scale 1:15 840
5000 Feet
(Sheet 113)

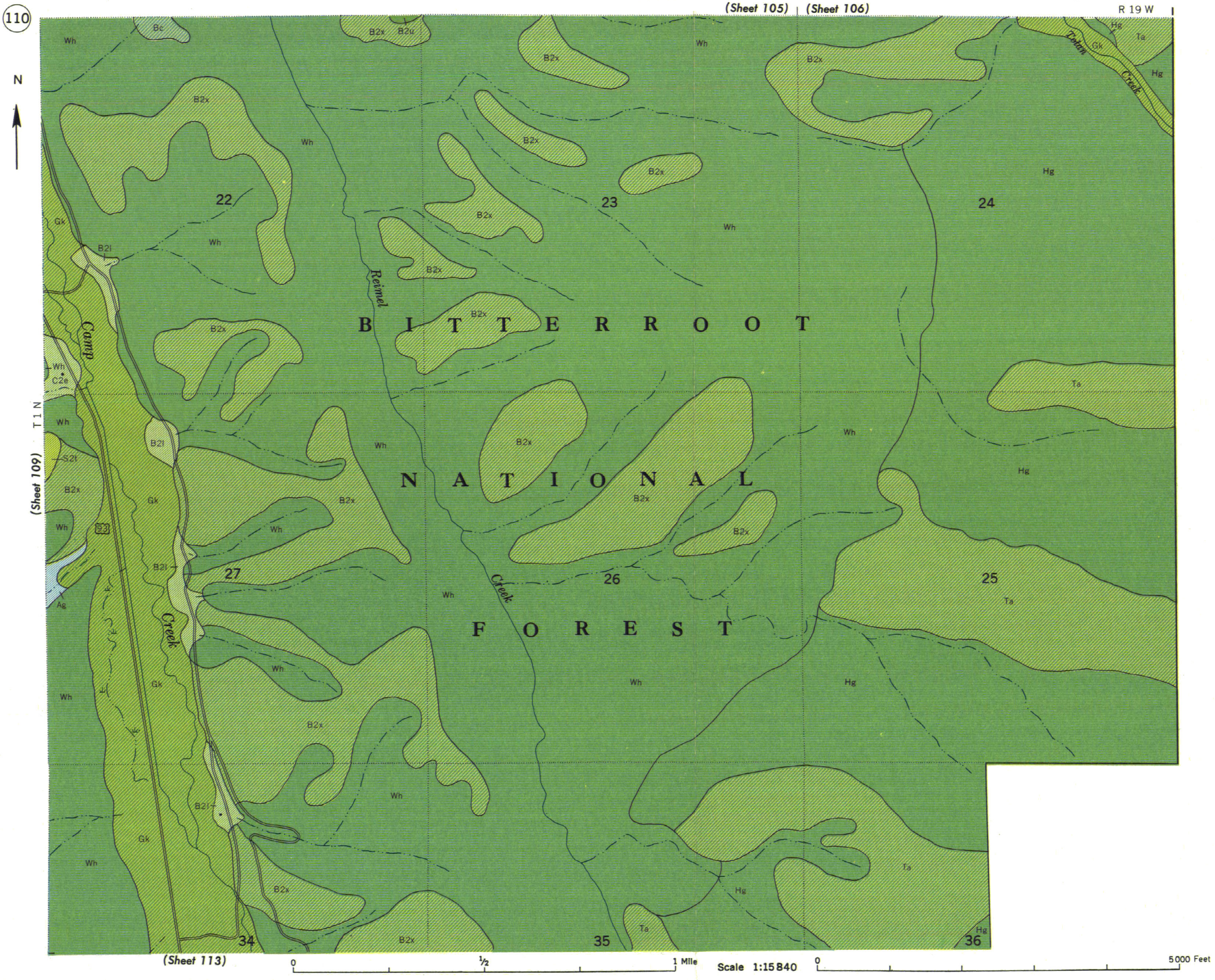
R 20 W

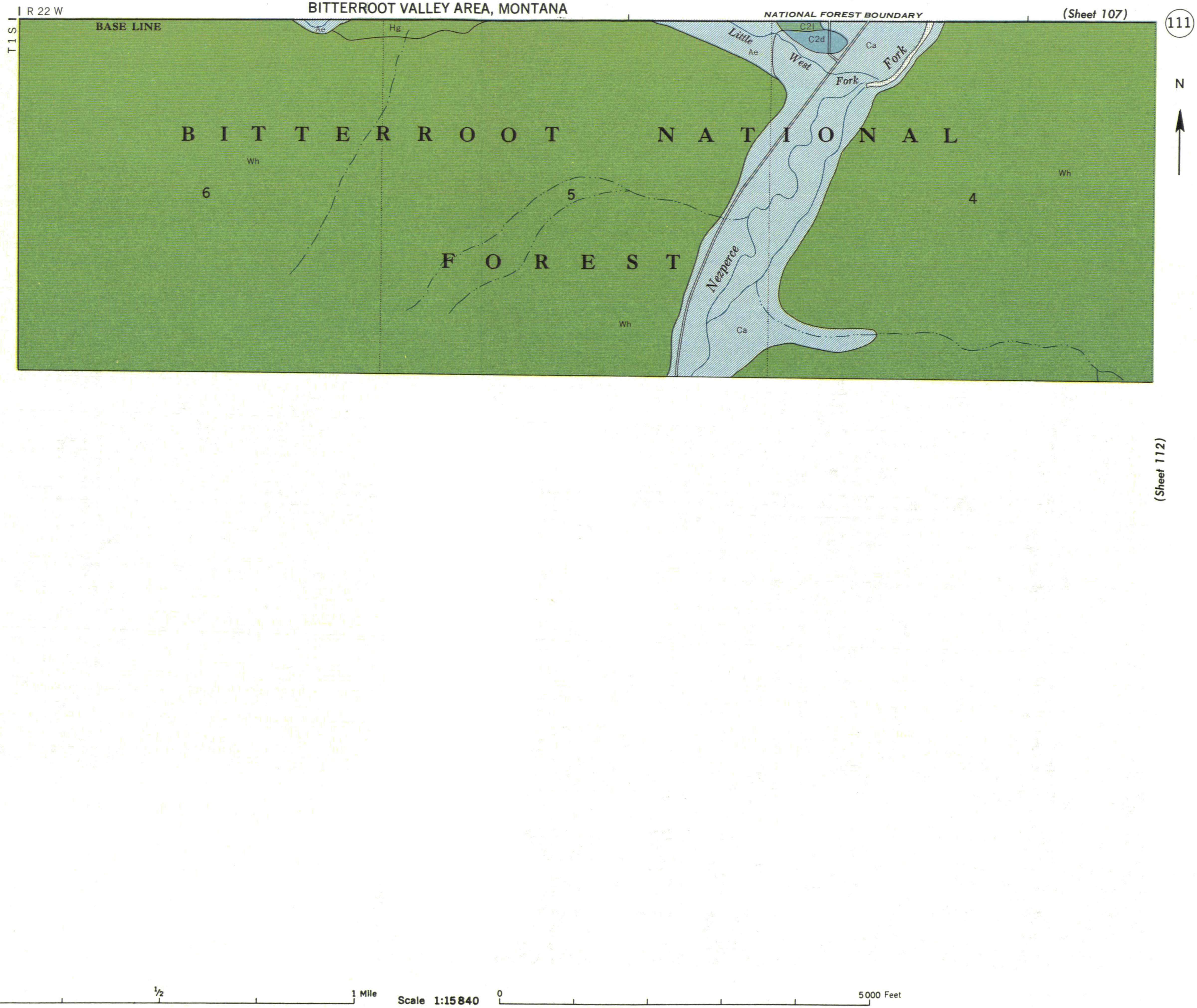


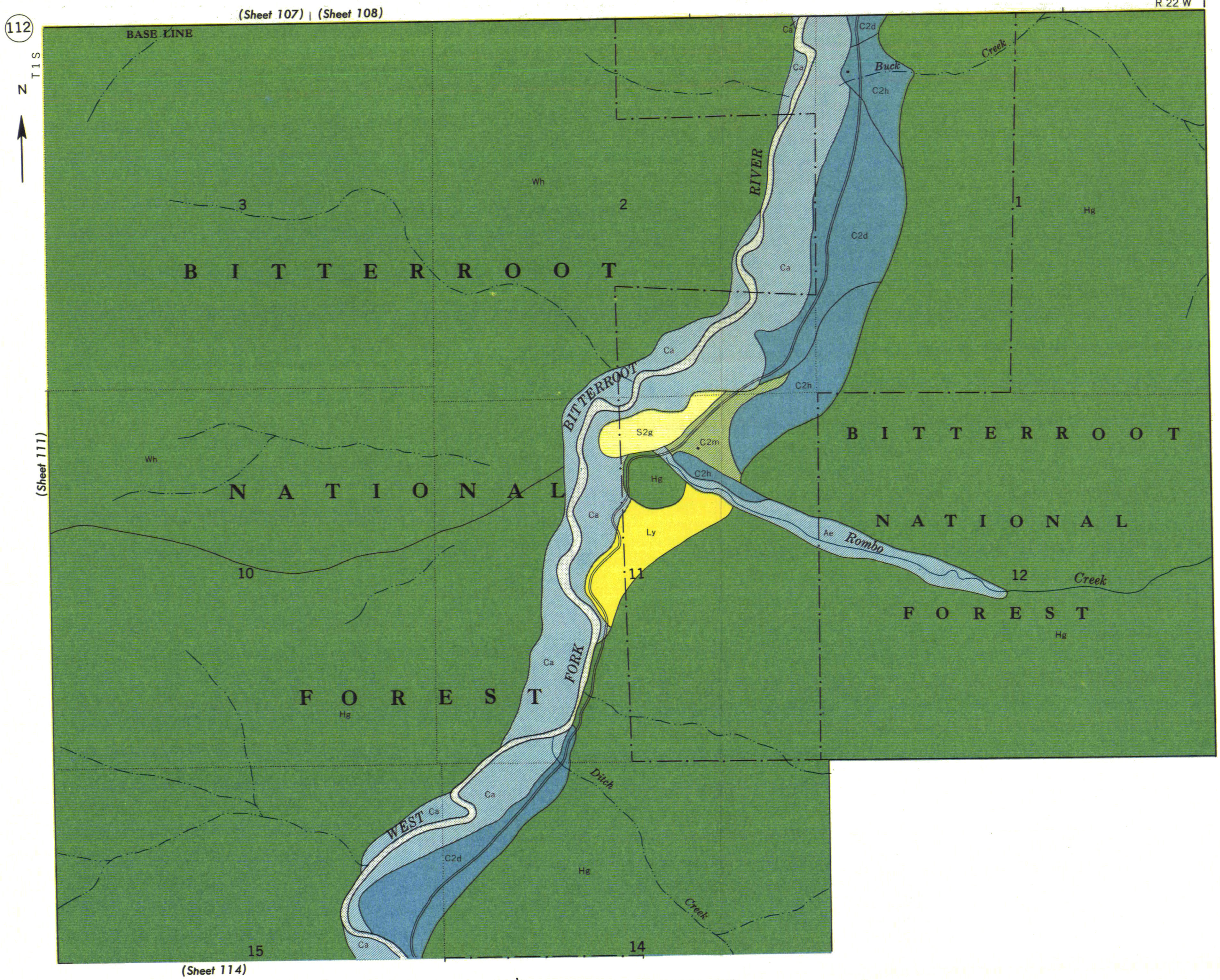
(Sheet 12)

(Sheet 15)

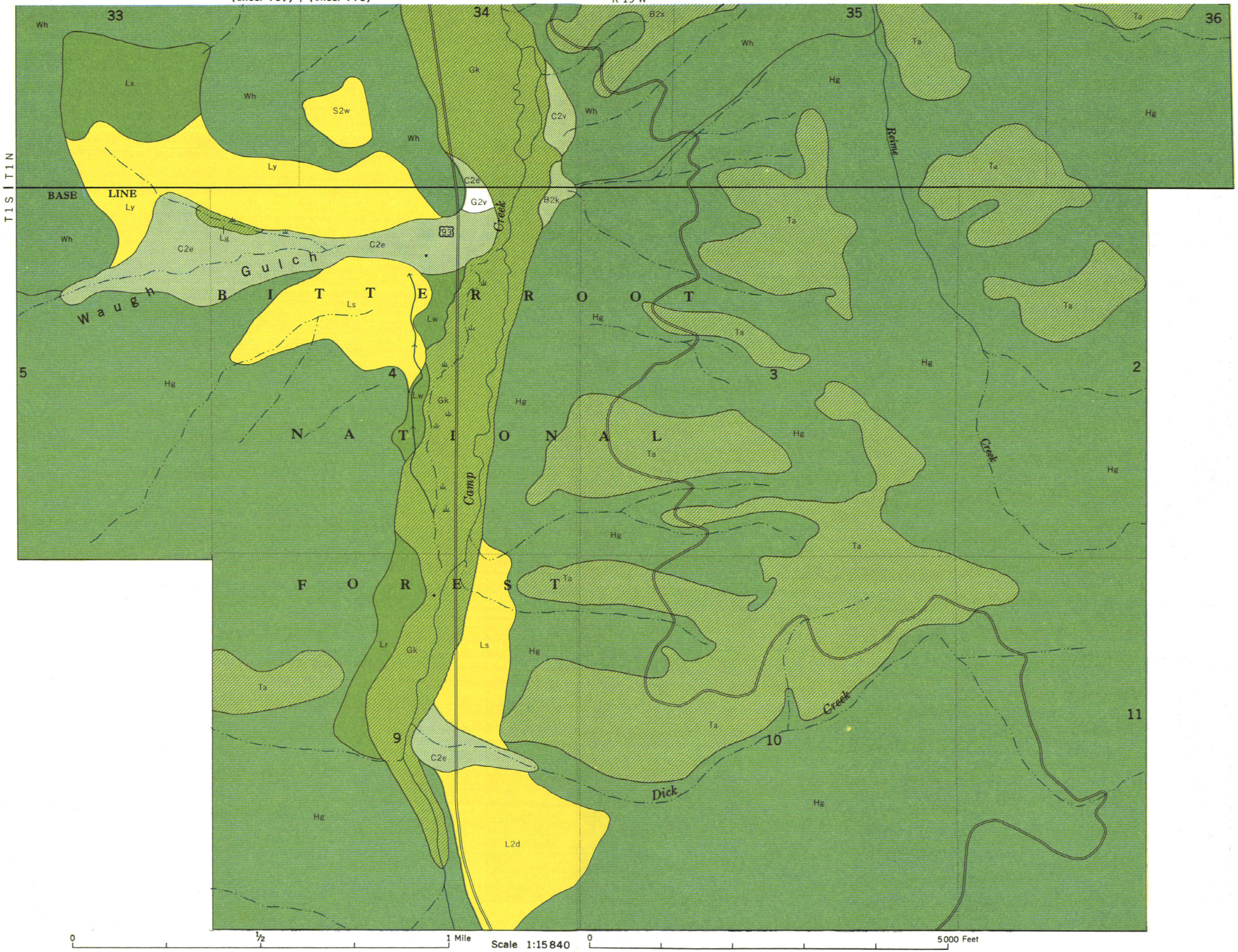
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet


(Sheet 105)
(Sheet 106)
R 19 W
N
T 1 N
(Sheet 109)
(Sheet 113)
B I T T E R R O O T
N A T I O N A L
F O R E S T
Reimel
Creek
Camp
Creek
Totem
Creek
22
23
24
25
26
27
34
35
36
93
Wh
Bc
B2x
B2u
B2l
Gk
Hg
Ta
C2e
S2l
Ag
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet


R 22 W
T 1 S
BASE LINE
NATIONAL FOREST BOUNDARY
N
BITTERROOT NATIONAL FOREST
Little West Fork
Fork
Nezperce
6
5
4
Wh
Ae
Hg
C2l
C2d
Ca
(Sheet 112)
0 ½ 1 Mile
Scale 1:15840
0 5000 Feet

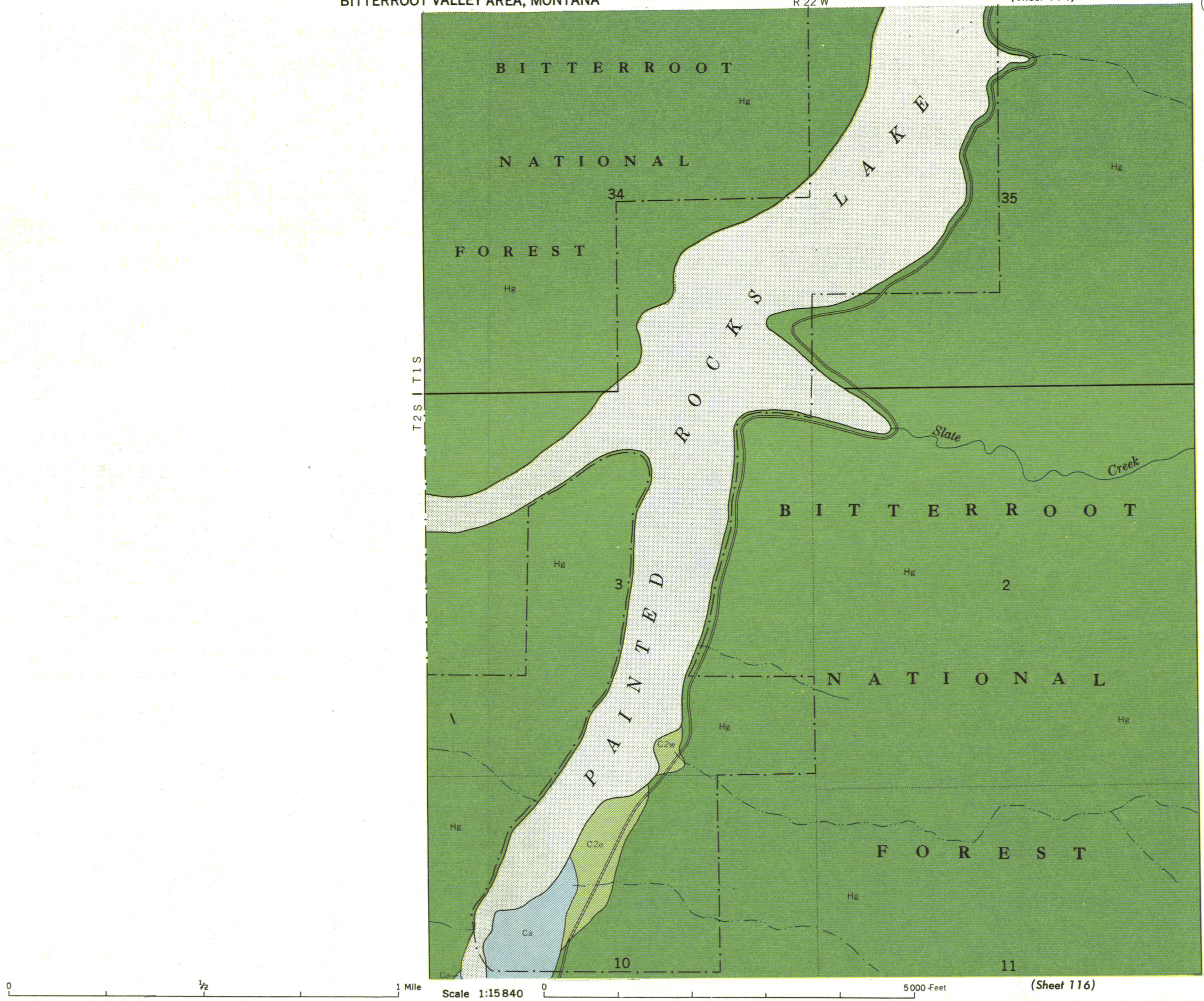


0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

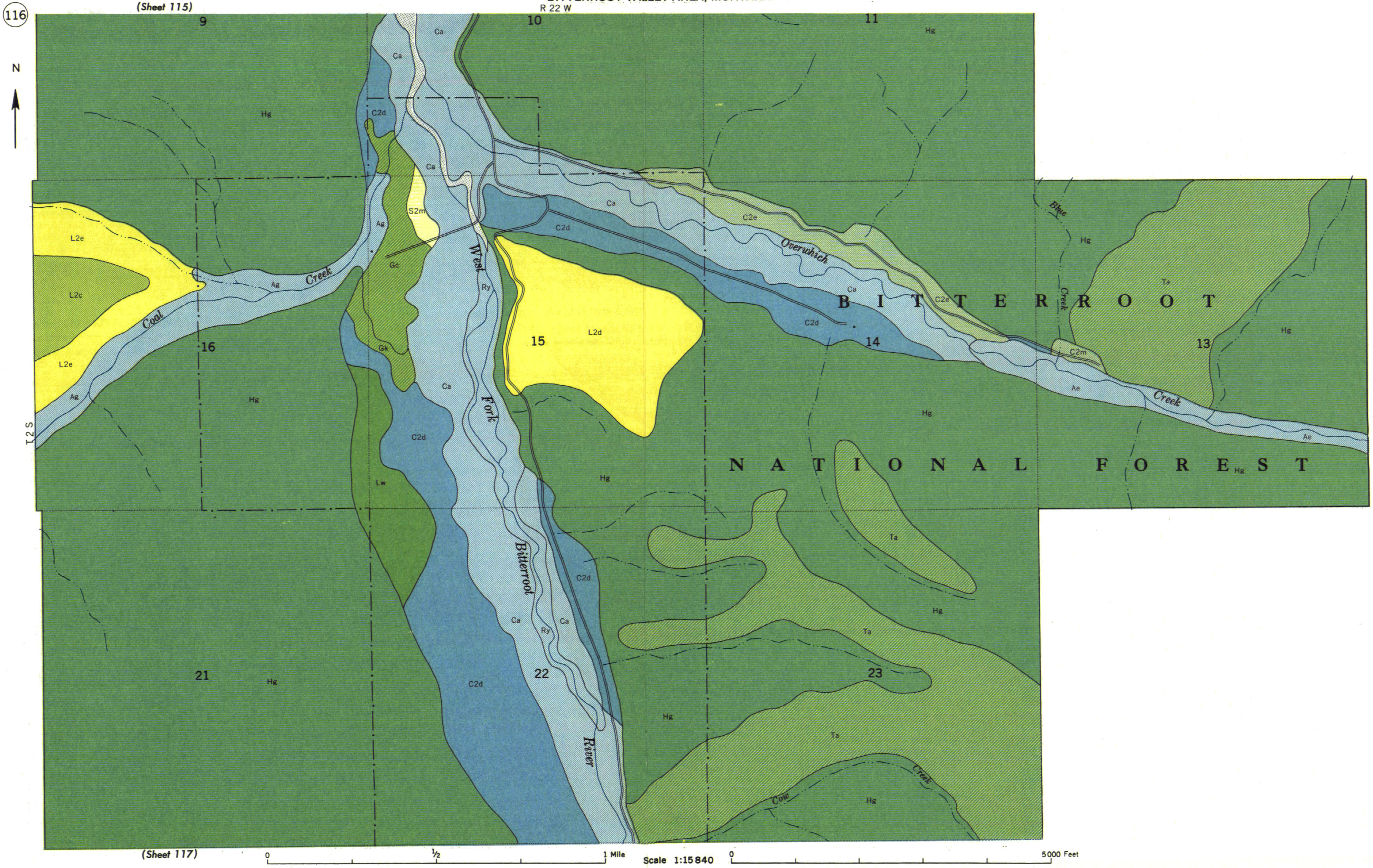

R 19 W
33
34
35
36
N
T1N
T1S
BASE LINE
B I T T E R R O O T
N A T I O N A L
F O R E S T
Waugh Gulch
Camp Creek
Reime Creek
Dick Creek
93
5
4
3
2
9
10
11
Wh
Lx
S2w
Ly
Lg
C2e
G2v
C2v
B2k
Gk
Ls
Lw
Lr
Hg
Ta
L2d
0
1/2
1 Mile
Scale 1:15840
0
5000 Feet

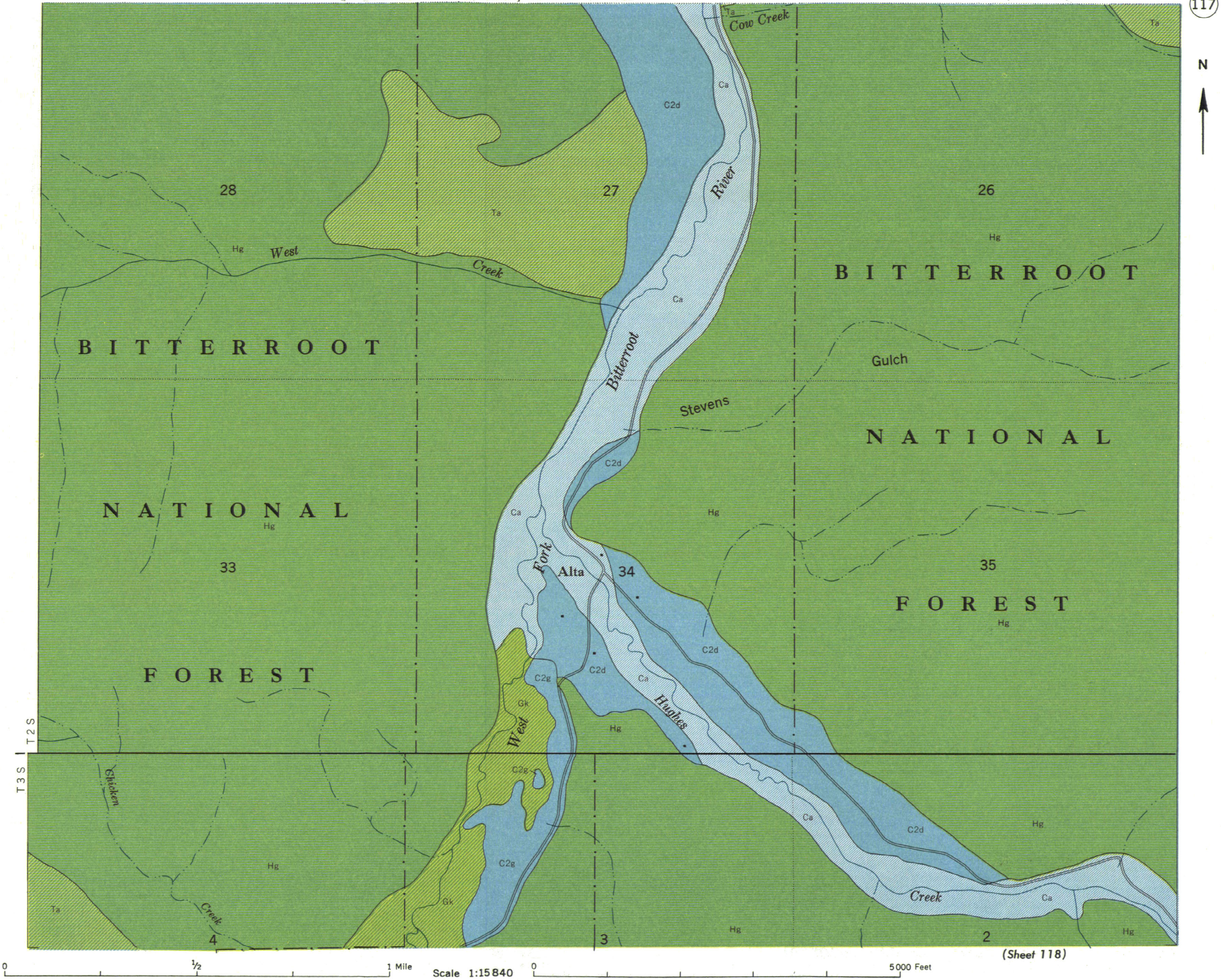
(Sheet 112)
R 22 W
15
14
N
Hg
Ca
C2d
C2e
BITTERROOT NATIONAL FOREST
WEST FORK BITTERROOT RIVER
C2m
22
23
T 1 S
C2n
Mud Creek
27
26
WEST FORK DAM
PAINTED ROCKS LAKE
Little Boulder Creek
(Sheet 115)
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

(Sheet 114)

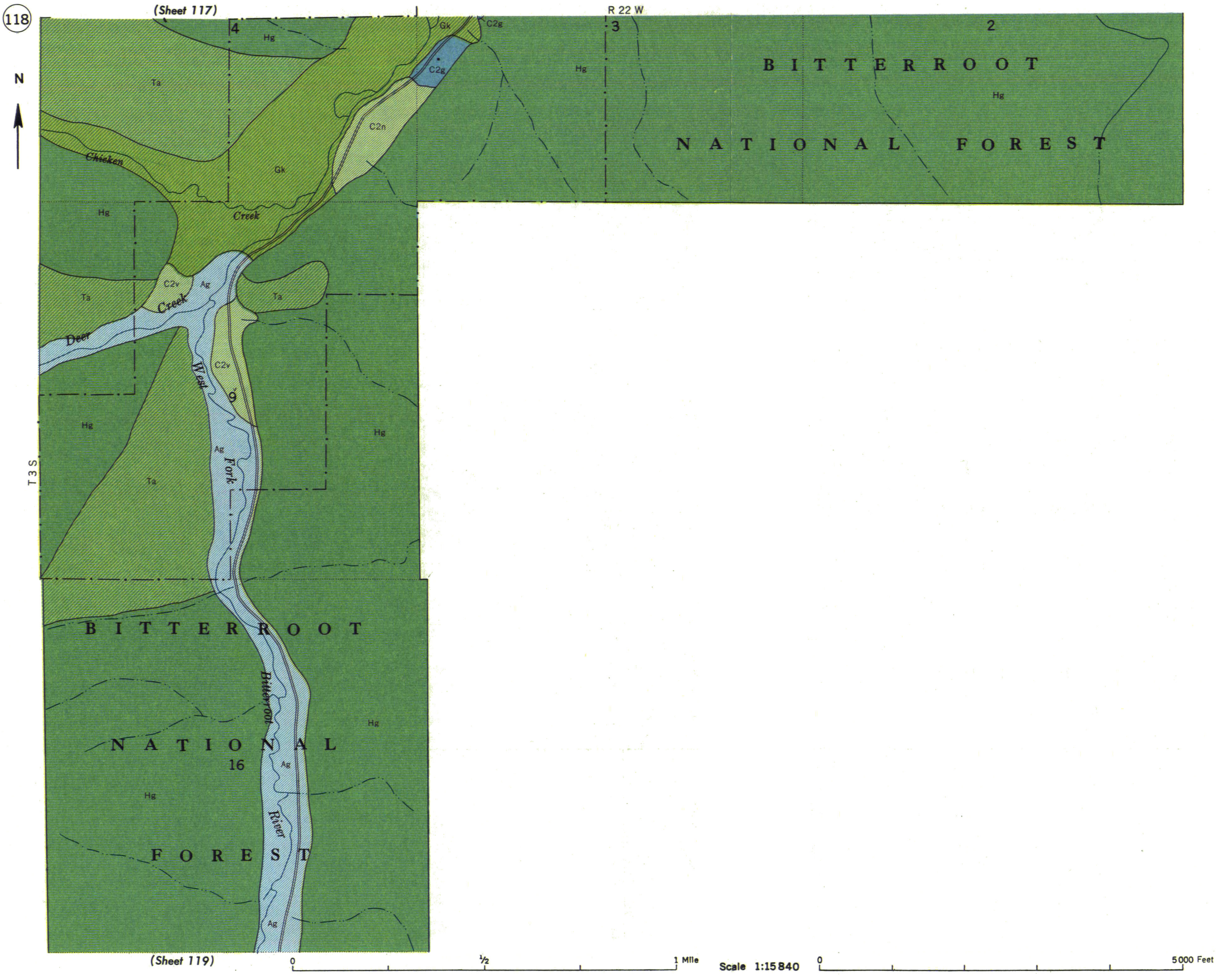


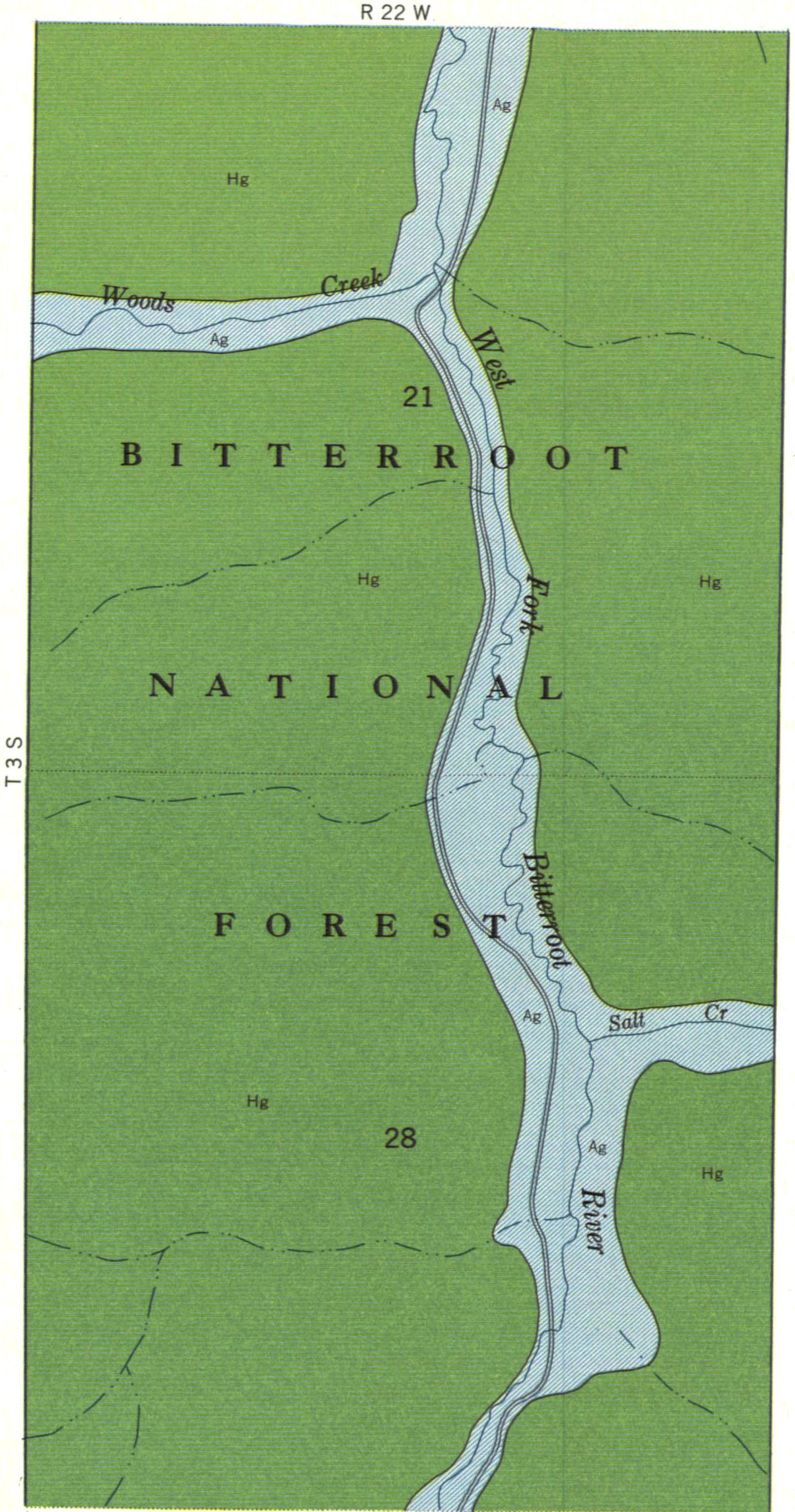
(Sheet 116)


116
(Sheet 115)
R 22 W
N
T 2 S
9
10
11
13
14
15
16
21
22
23
Coal Creek
West Fork Bitterroot River
Overwhich Creek
Blue Creek
Cow Creek
BITTERROOT NATIONAL FOREST
Hg
Ca
C2d
C2e
C2m
S2m
Ag
Gc
Gk
Ry
Lw
L2e
L2c
L2d
Ta
Ae
(Sheet 117)
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet

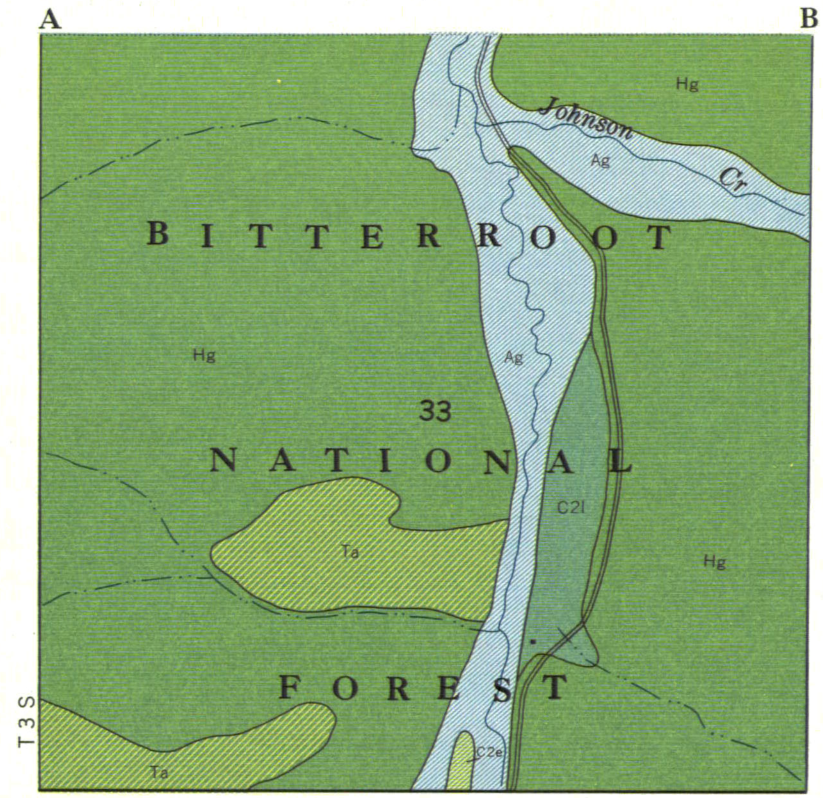

N
Cow Creek
Ta
Ca
C2d
28
27
26
Ta
Hg
West
Creek
River
Hg
BITTERROOT
Bitterroot
BITTERROOT
Gulch
Stevens
NATIONAL
C2d
NATIONAL
Hg
Ca
Hg
Fork
Alta
34
33
35
FOREST
FOREST
C2d
C2d
C2g
Gk
Ca
Hughes
West
Hg
T2S
T3S
Chicken
C2g
Ca
C2d
Hg
C2g
Hg
Ta
Creek
Gk
Creek
Ca
4
3
Hg
2
Hg
0
1/2
1 Mile
Scale 1:15840
0
5000 Feet

118


(Sheet 117)
R 22 W
N
4
3
2
Hg
Gk
C2g
BITTERROOT
NATIONAL FOREST
Ta
C2n
Chicken
Creek
Ag
C2v
Deer
Creek
West
Fork
9
T 3 S
Bitterroot
River
16
(Sheet 119)
0
½
1 Mile
Scale 1:15 840
0
5000 Feet



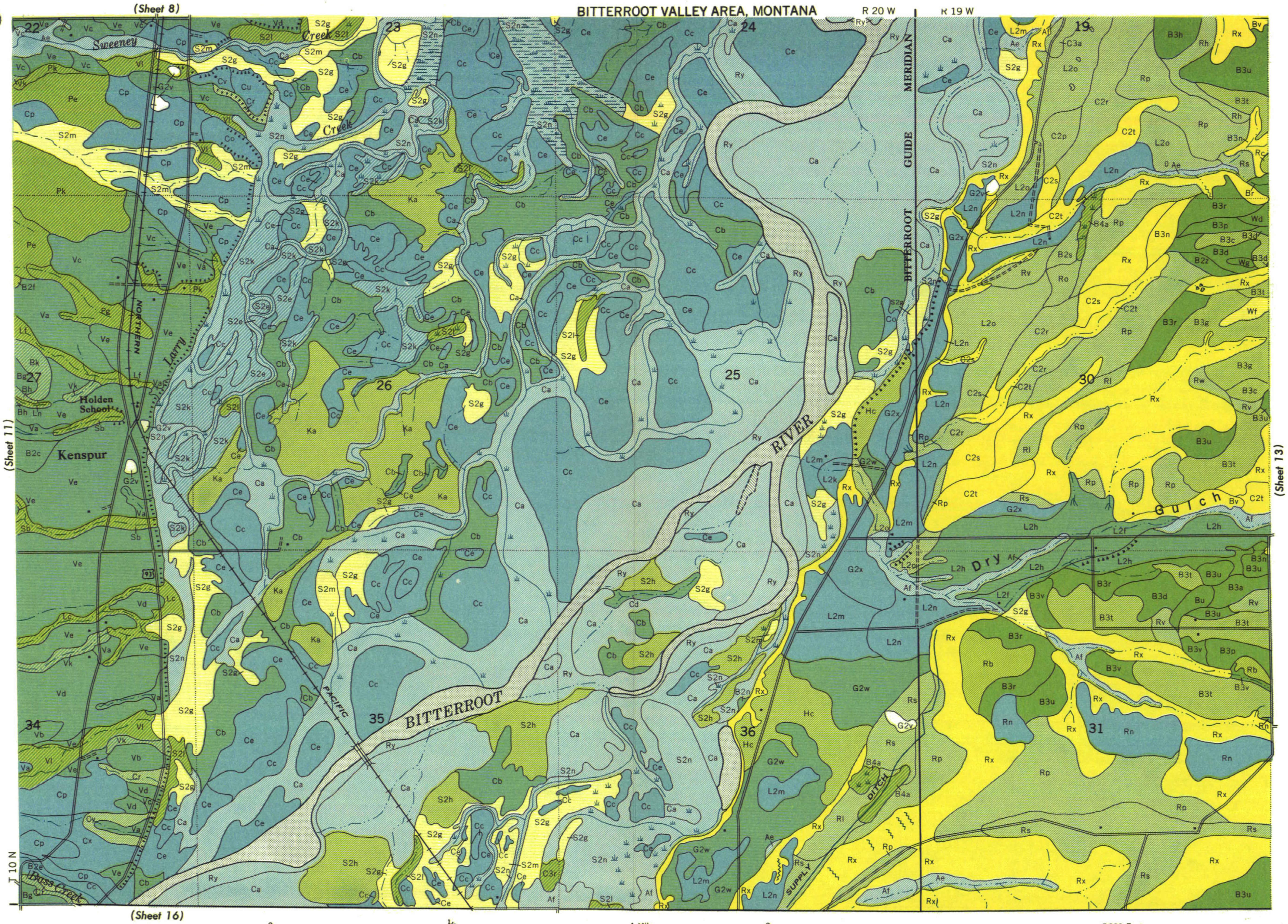
(Joins insert)



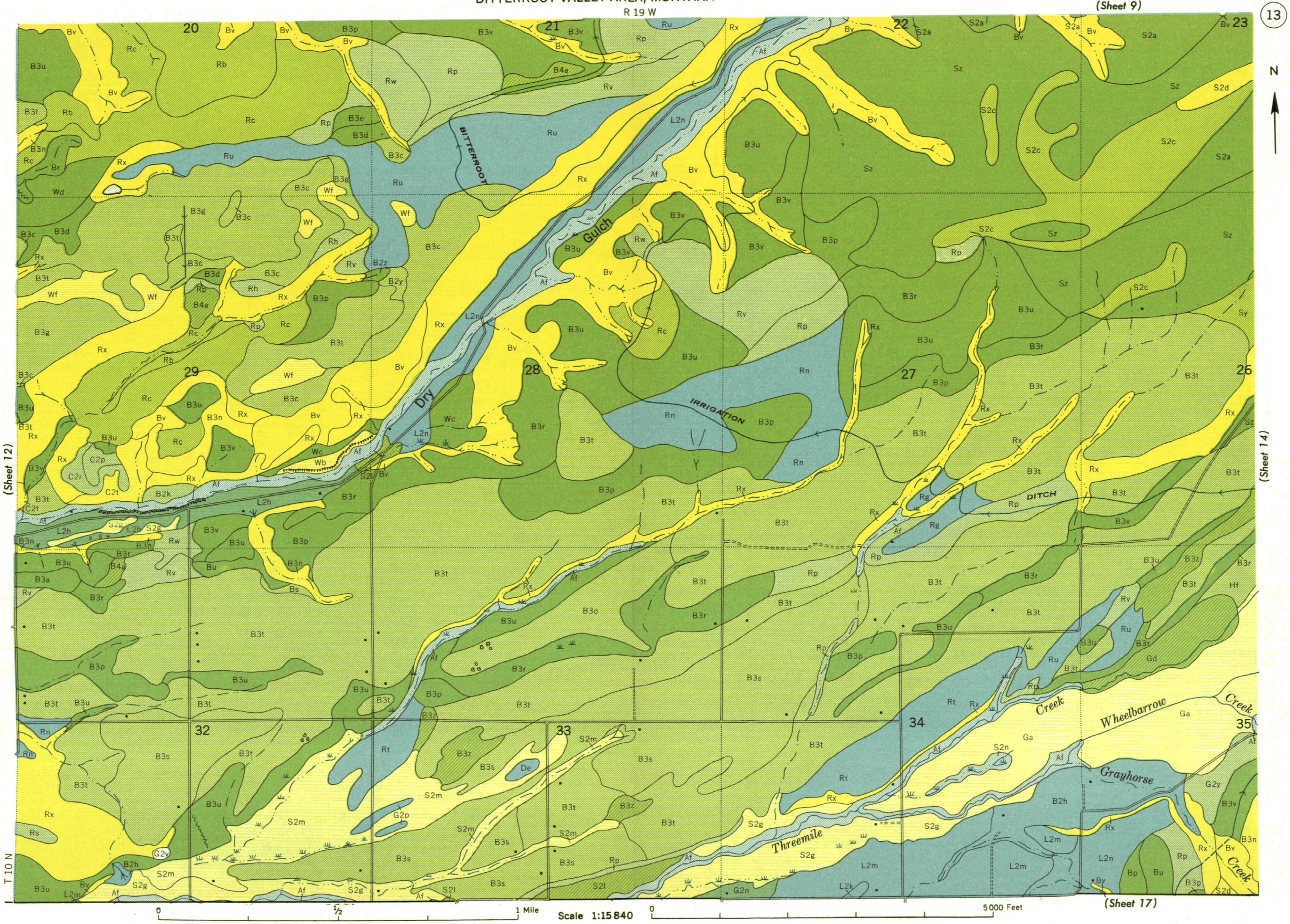
INSERT—(A-B JOINS A-B LEFT)

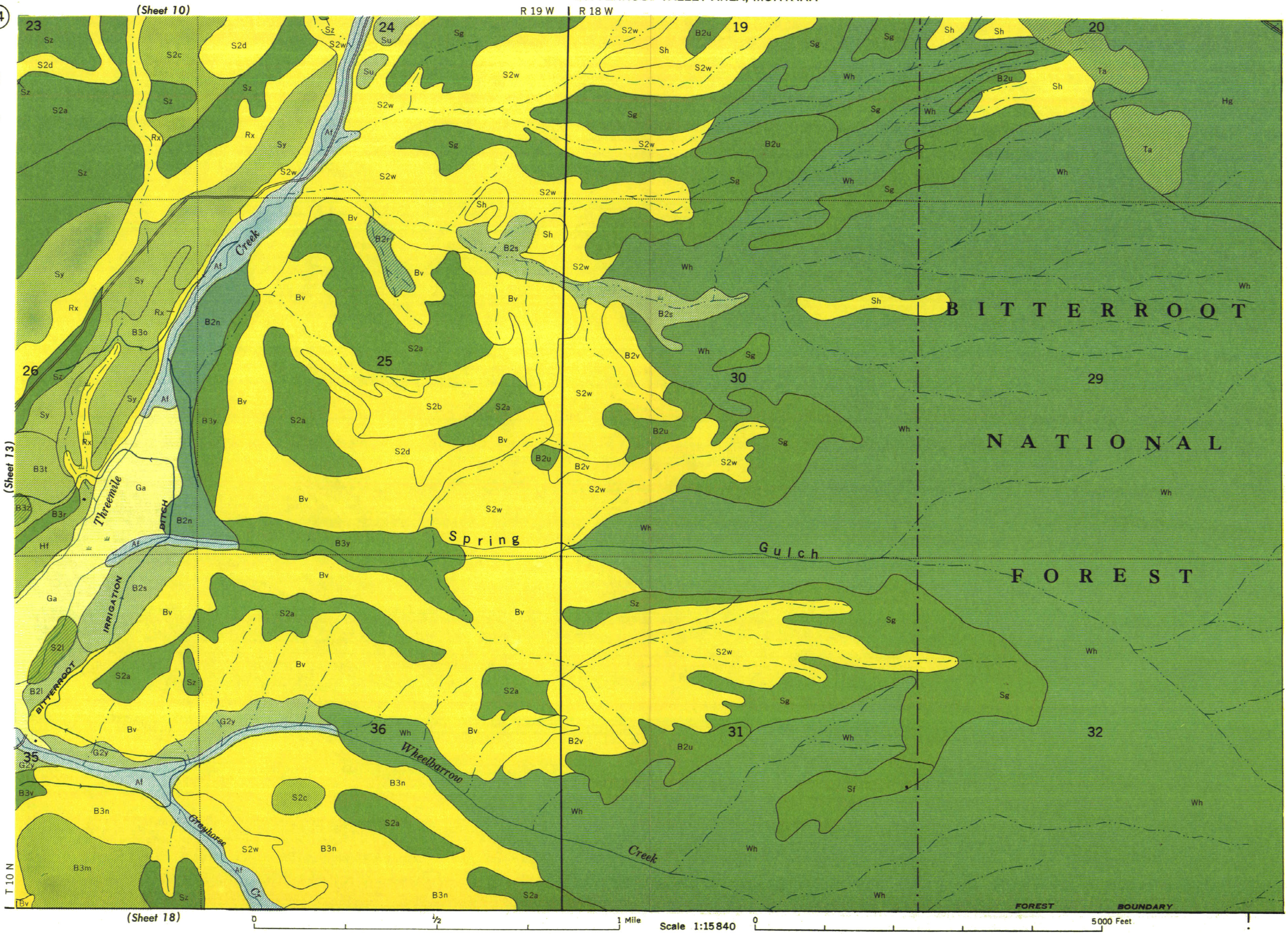
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

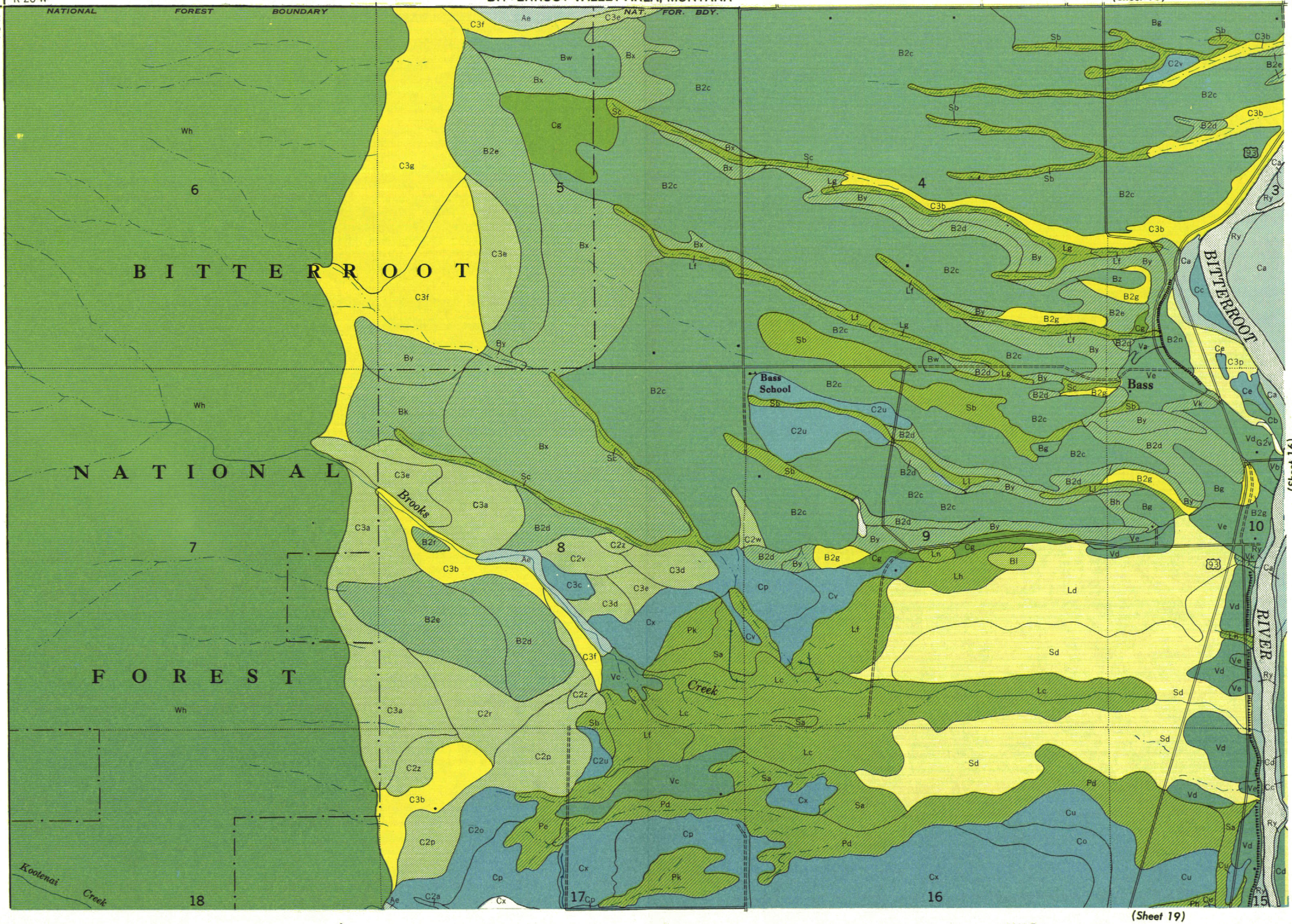
BITTERROOT VALLEY AREA, MONTANA



0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

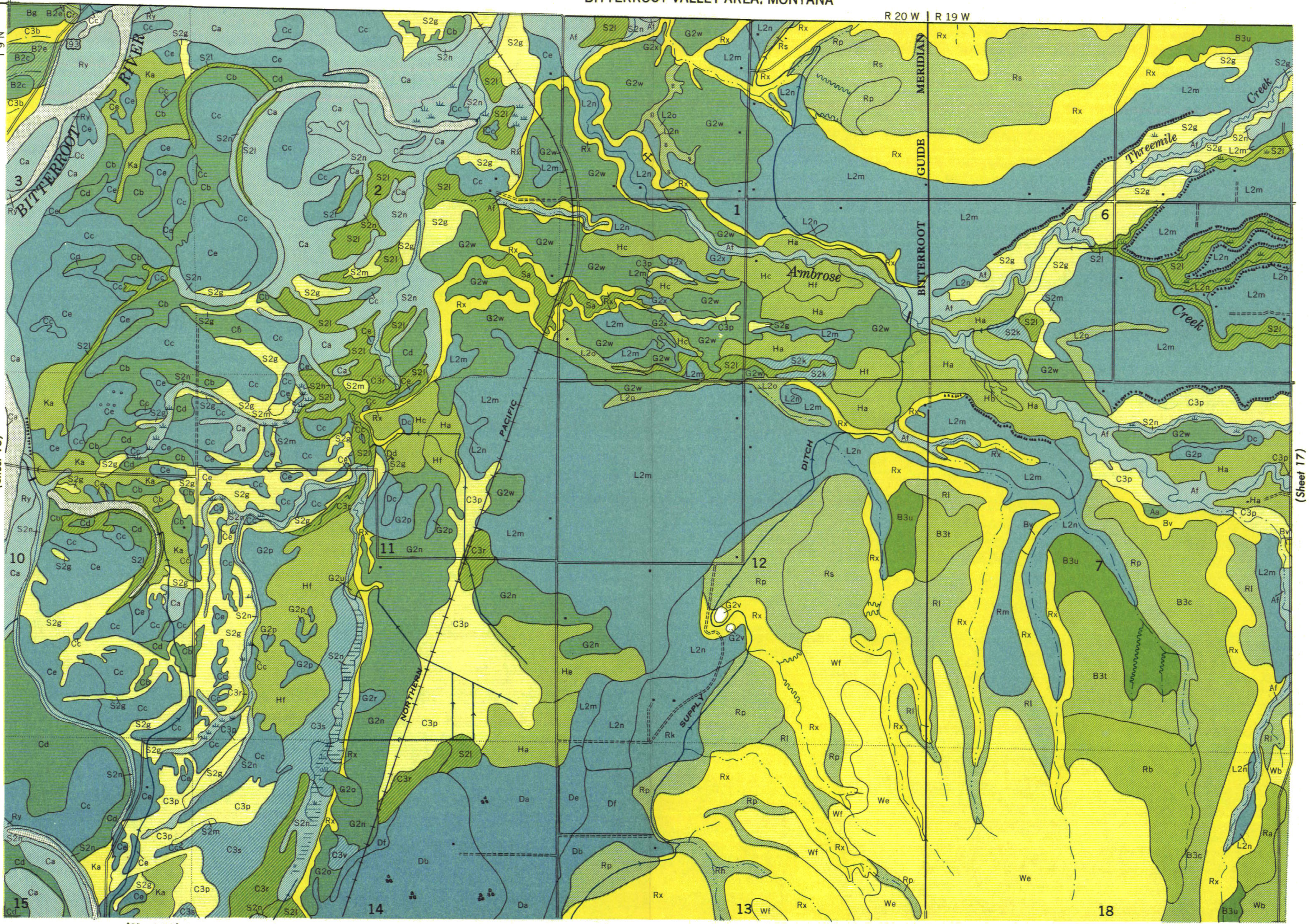

R 19 W
(Sheet 9)
N
(Sheet 12)
(Sheet 14)
(Sheet 17)
T 10 N
20
21
22
23
26
27
28
29
32
33
34
35
BITTERROOT
Dry
Gulch
IRRIGATION
DITCH
Creek
Wheelbarrow
Creek
Grayhorse
Threemile
Creek
0
1/2
1 Mile
Scale 1:15840
0
5000 Feet


(Sheet 10)
R 19 W
R 18 W
N
(Sheet 13)
(Sheet 18)
T 10 N
BITTERROOT
NATIONAL
FOREST
Spring
Gulch
Threemile
Creek
DITCH
IRRIGATION
BITTERROOT
Wheelbarrow
Creek
Greyhorse
FOREST
BOUNDARY
23
24
19
20
26
25
30
29
35
36
31
32
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet



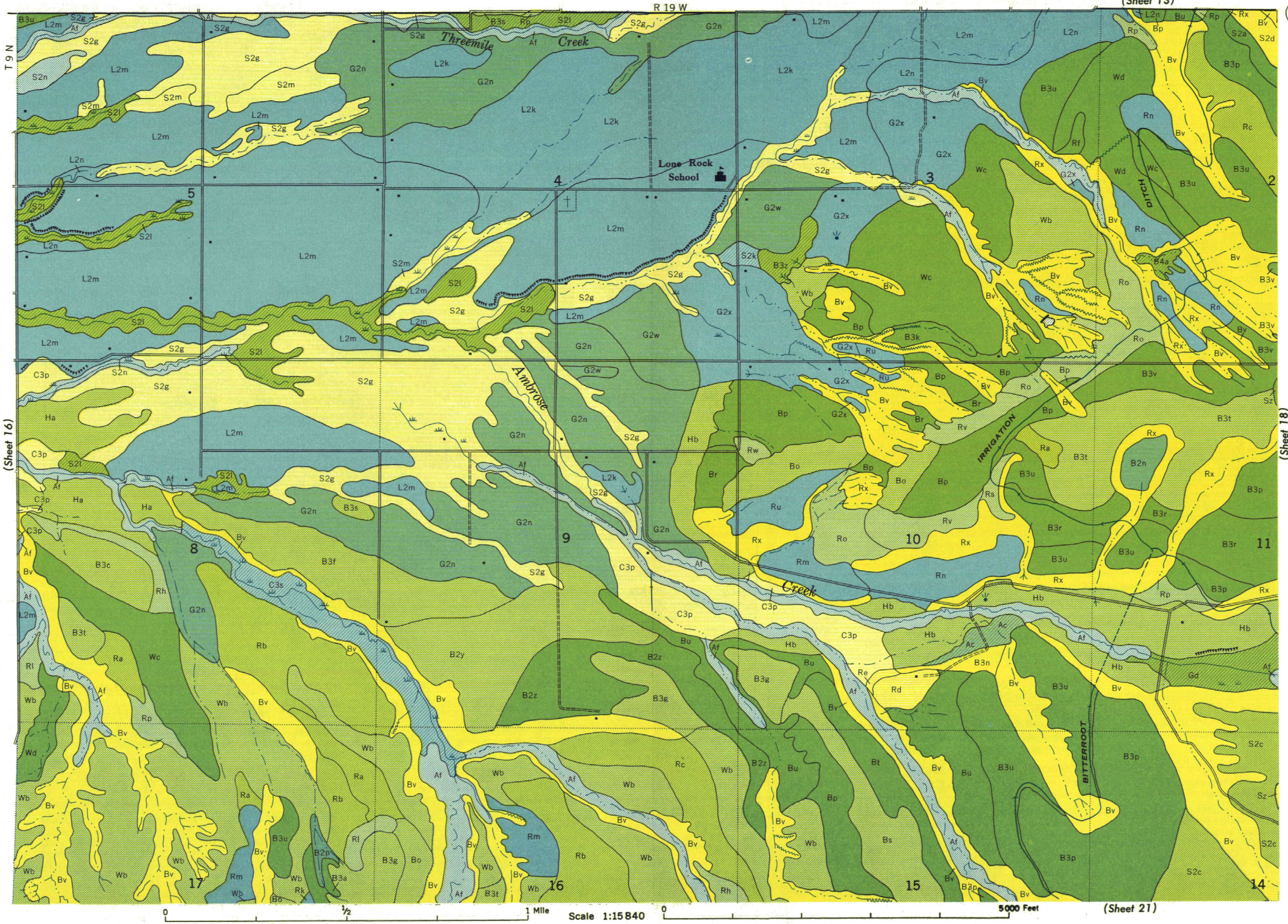
Scale 1:15 840 0 ½ 1 Mile 0 5000 Feet

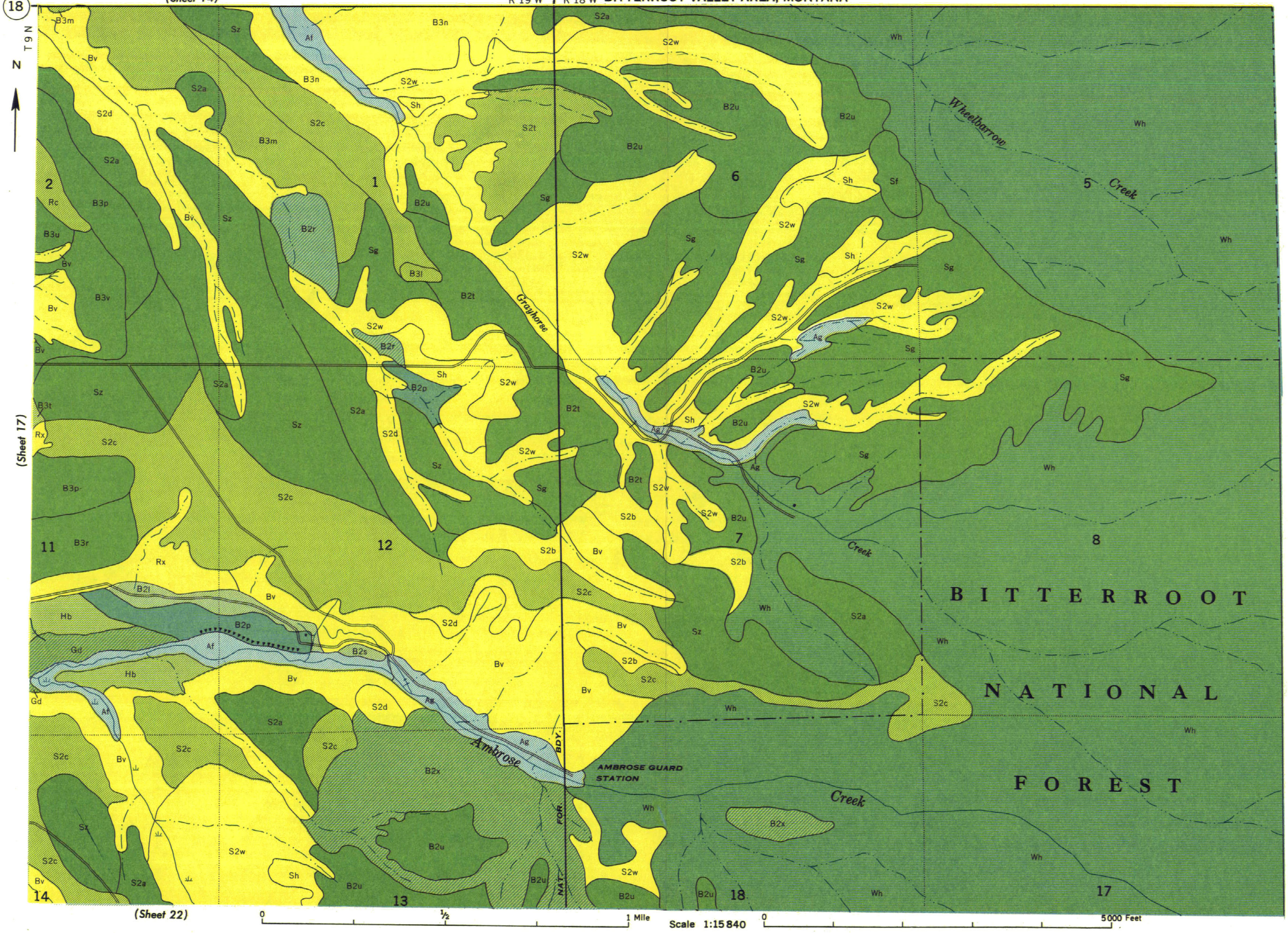
(Sheet 12)

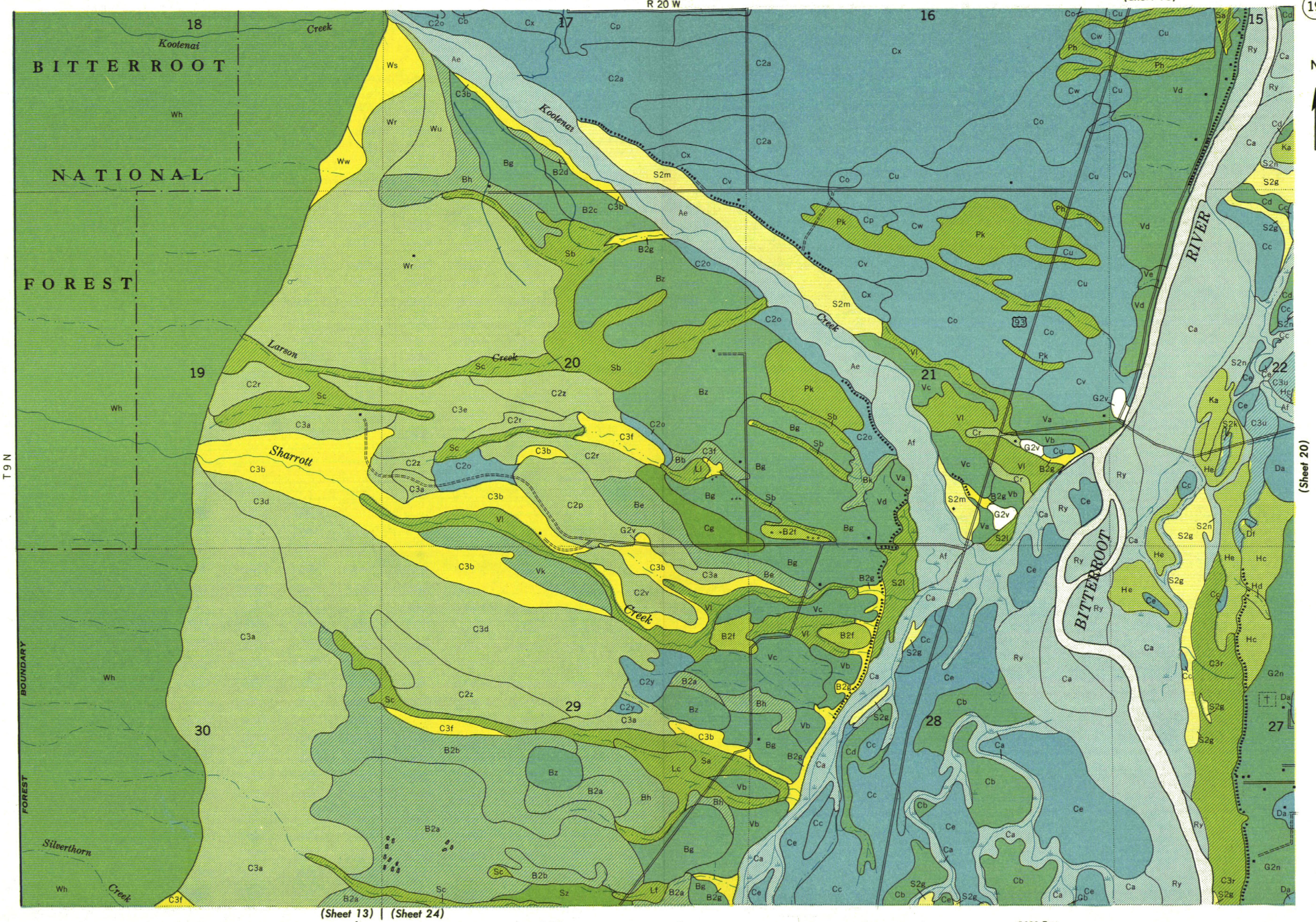


(Sheet 15)
(Sheet 17)
(Sheet 20)

0 ½ 1 Mile
Scale 1:15 840
0 5000 Feet


R 19 W
T 9 N
(Sheet 13)
(Sheet 16)
(Sheet 18)
(Sheet 21)
N
Threemile
Creek
Lone Rock School
Ambrose
Creek
IRRIGATION
DITCH
BITTERROOT
4
5
3
2
8
9
10
11
17
16
15
14
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet


T 9 N
N
(Sheet 17)
Wheelbarrow
Creek
Grayhorse
Creek
Ambrose
Creek
BITTERROOT
NATIONAL
FOREST
AMBROSE GUARD STATION
NAT. FOR. BDY.
1
2
5
6
7
8
11
12
13
14
17
18
(Sheet 22)
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

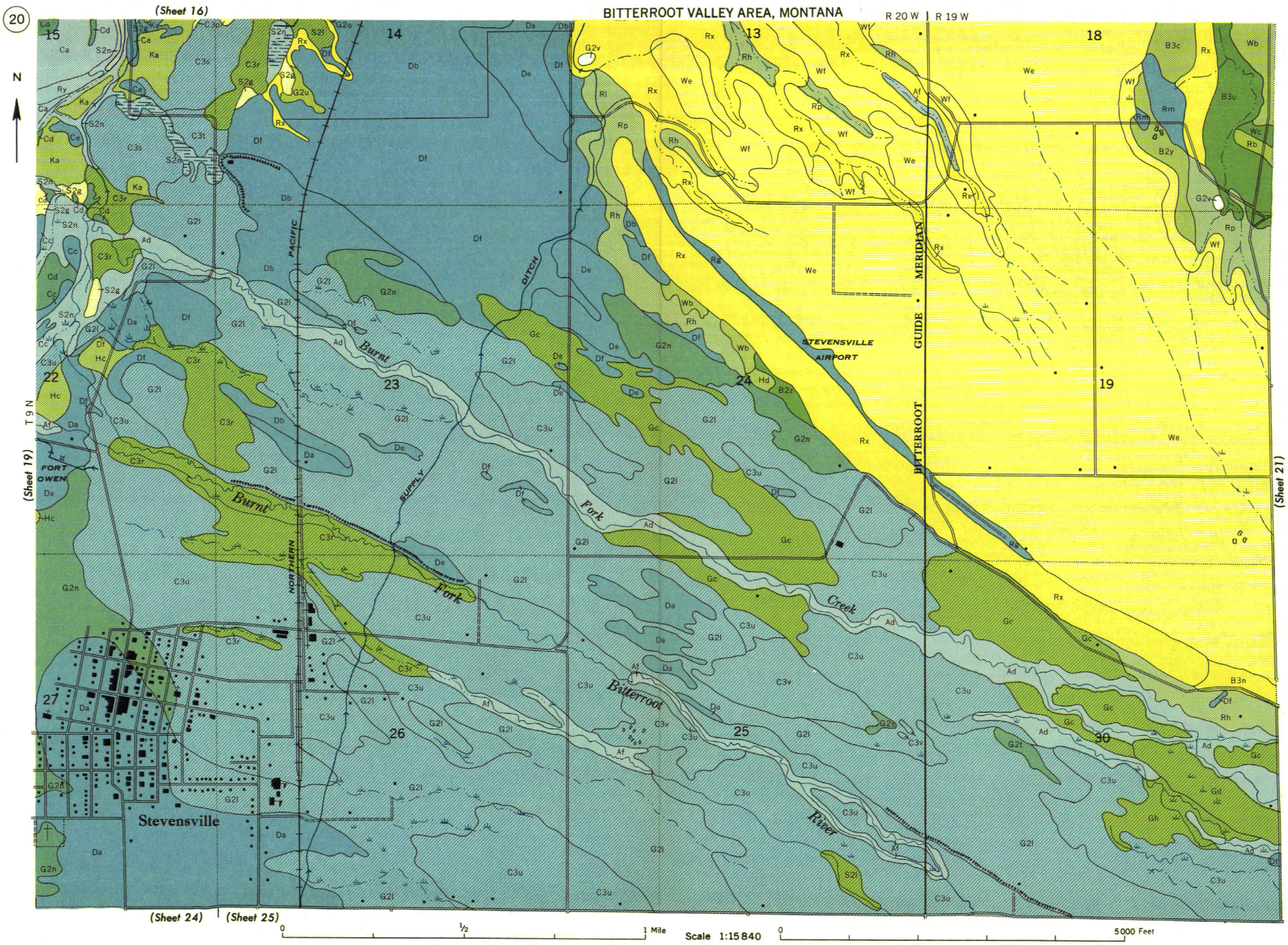


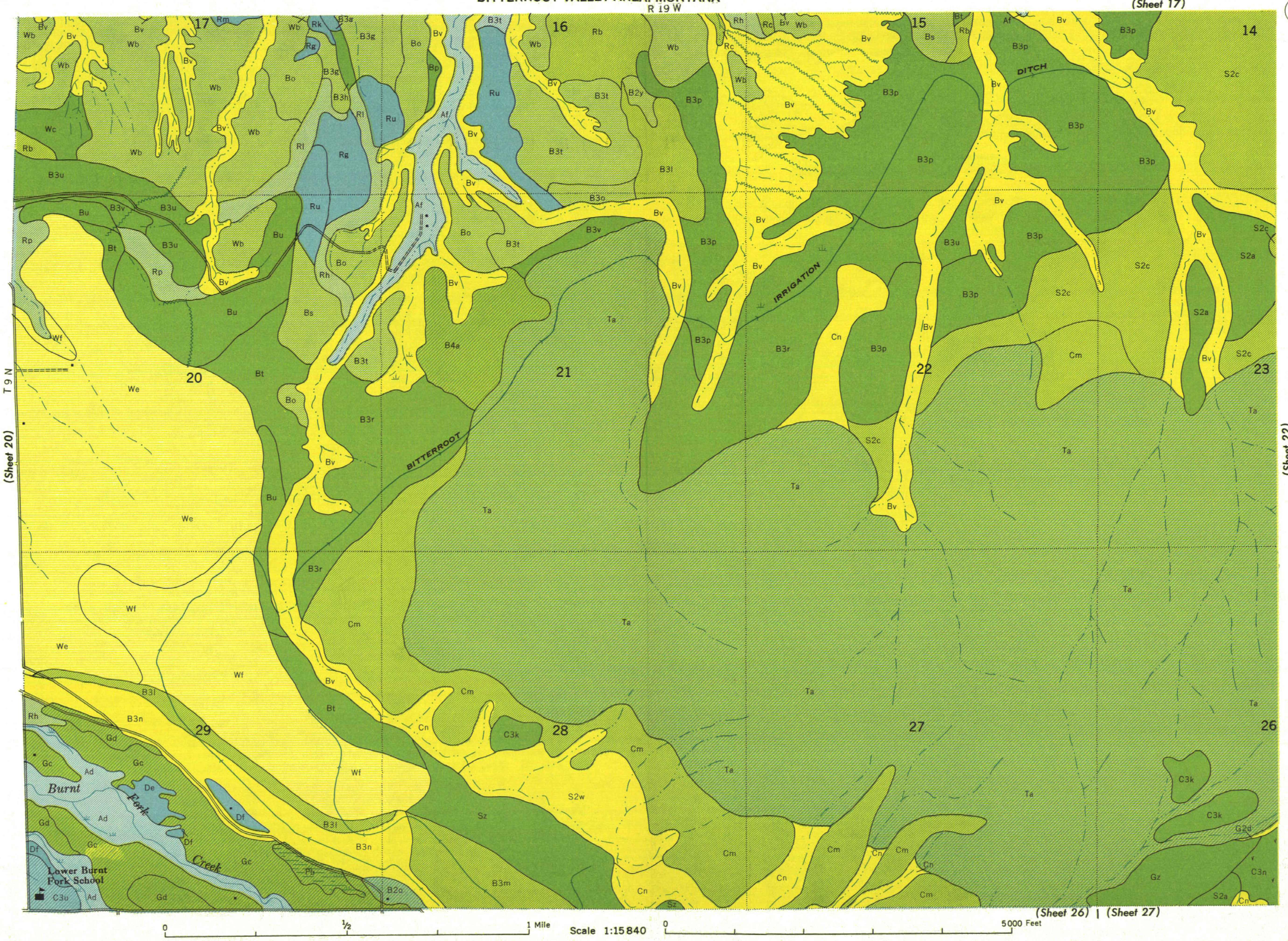
0 ½ 1 Mile

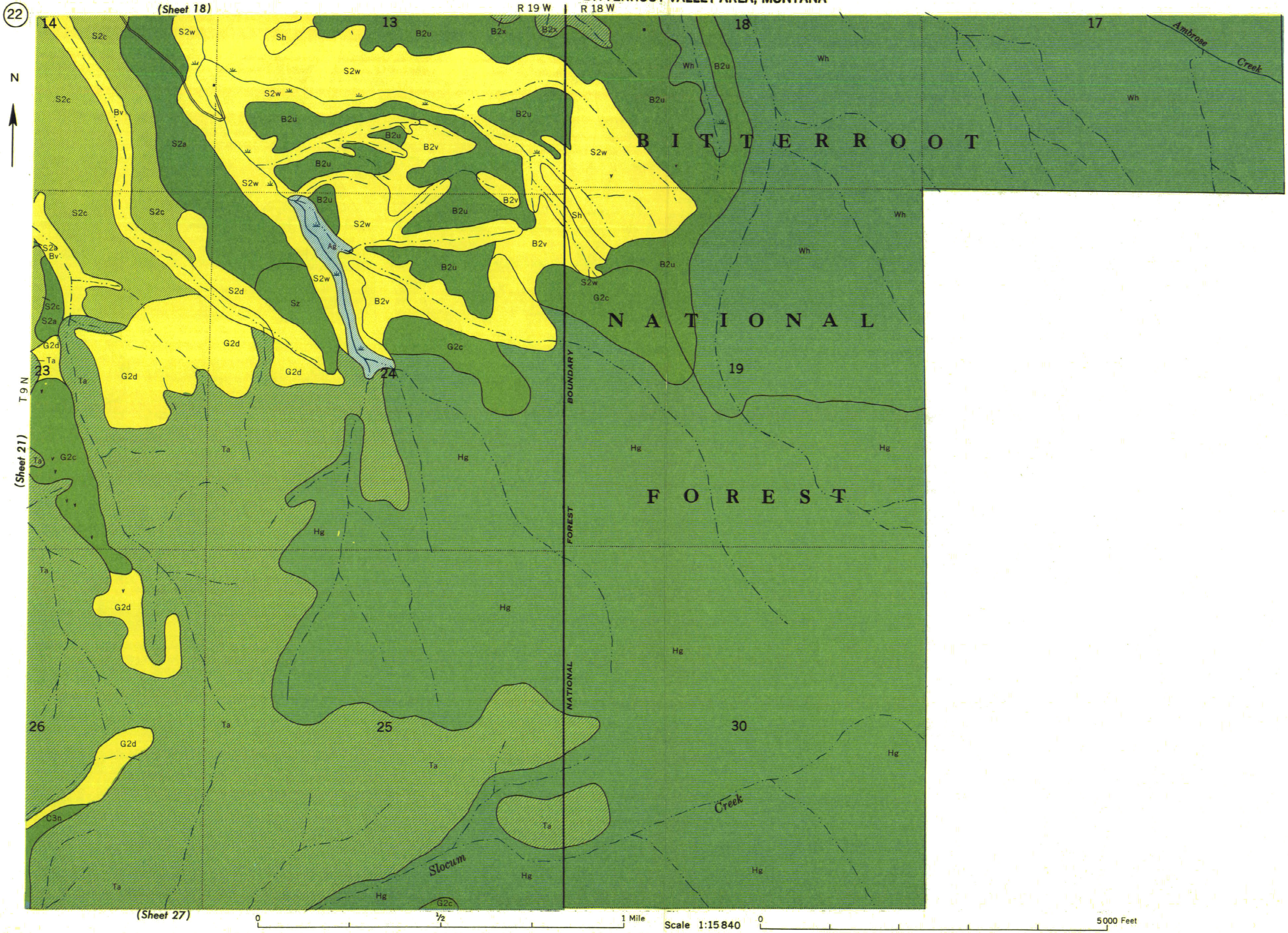
Scale 1:15 840

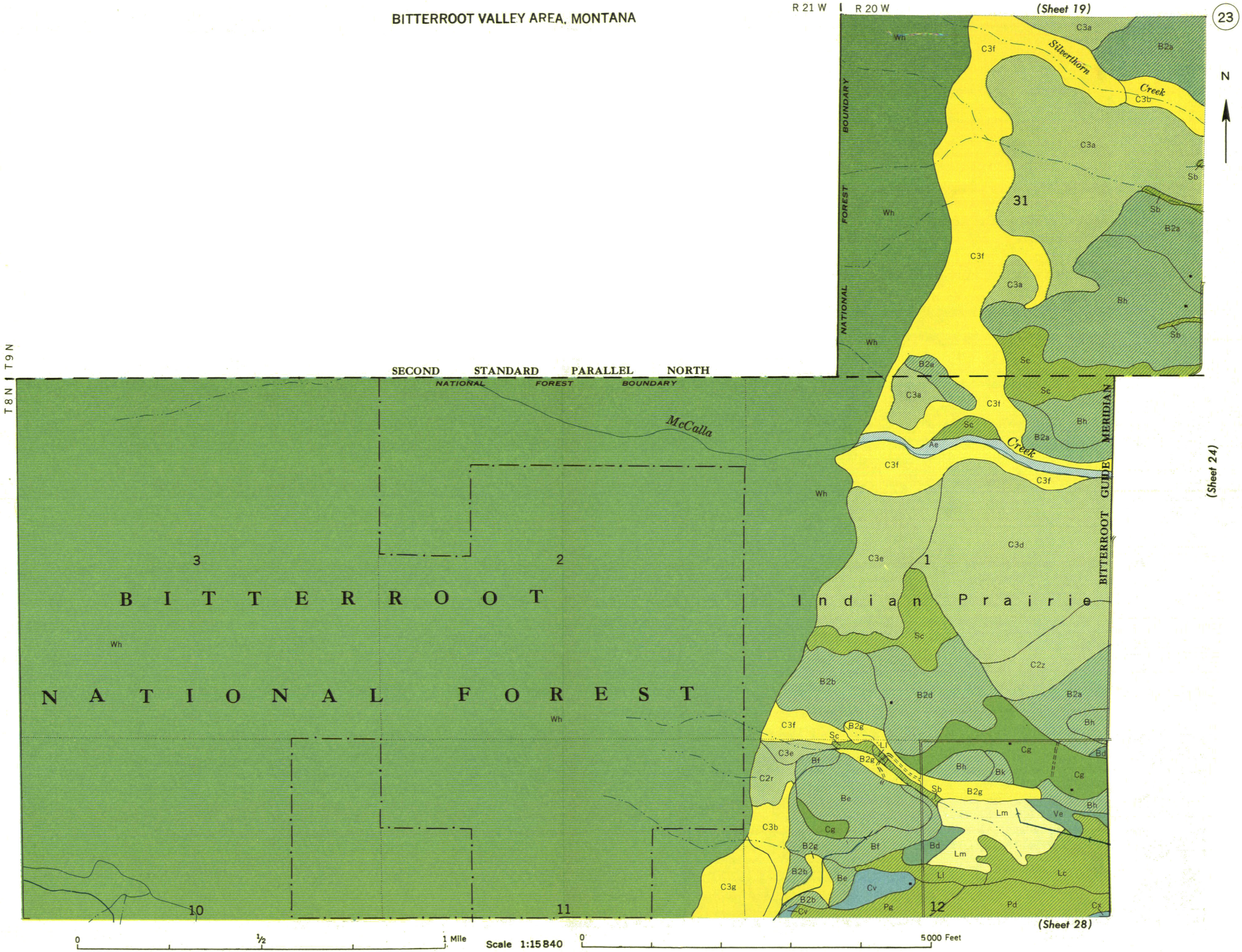
0 5000 Feet

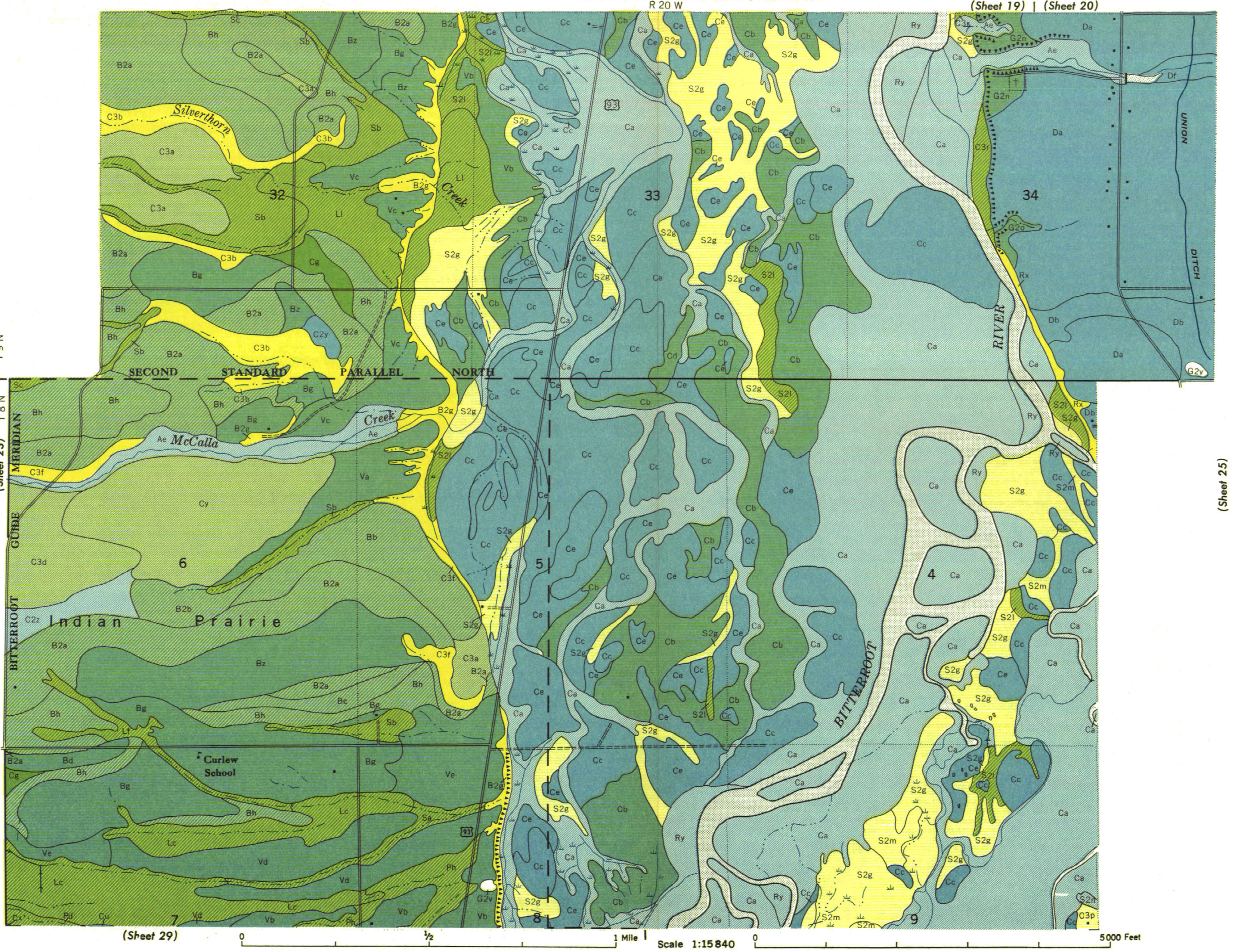
BITTERROOT VALLEY AREA, MONTANA

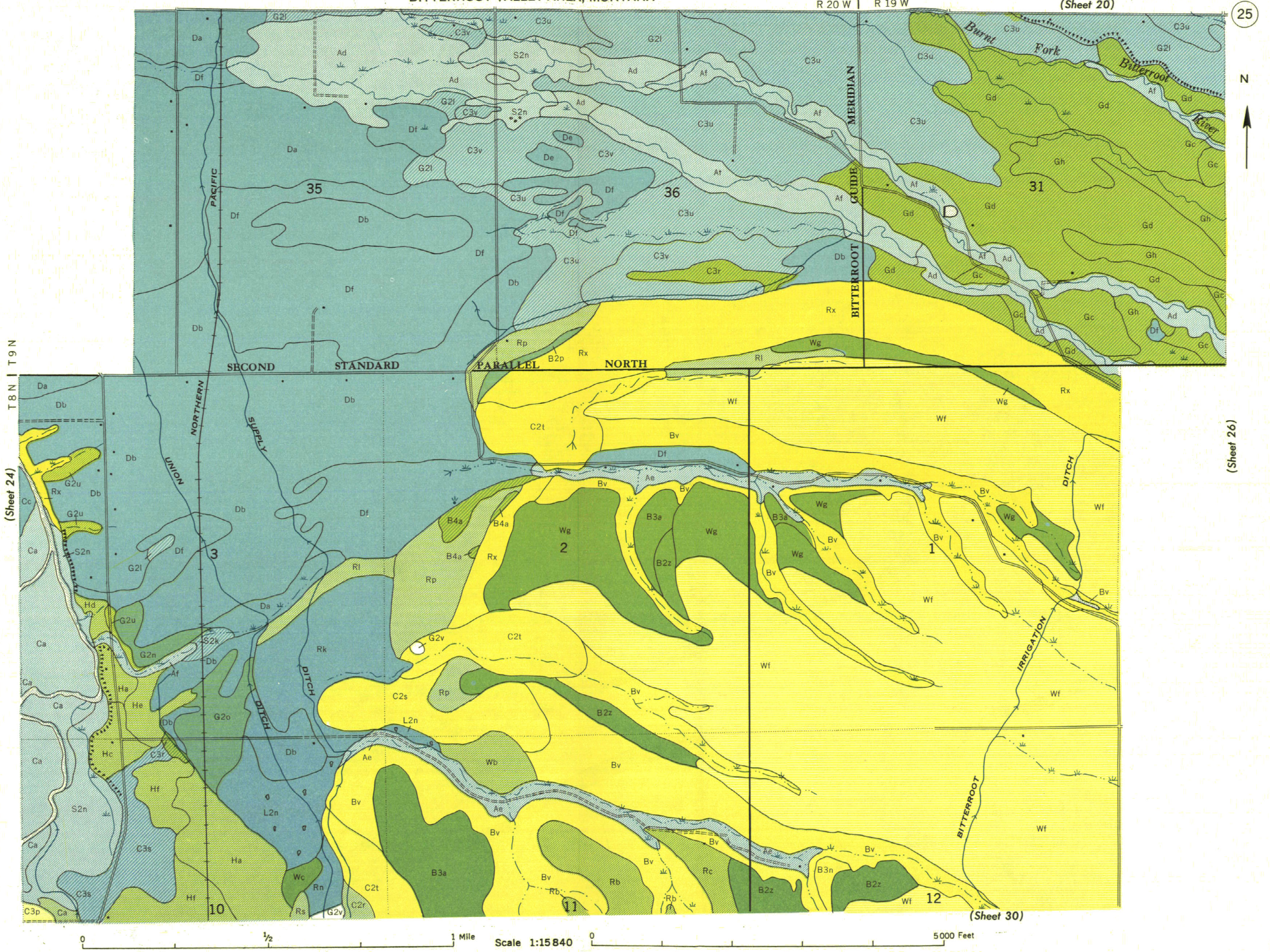


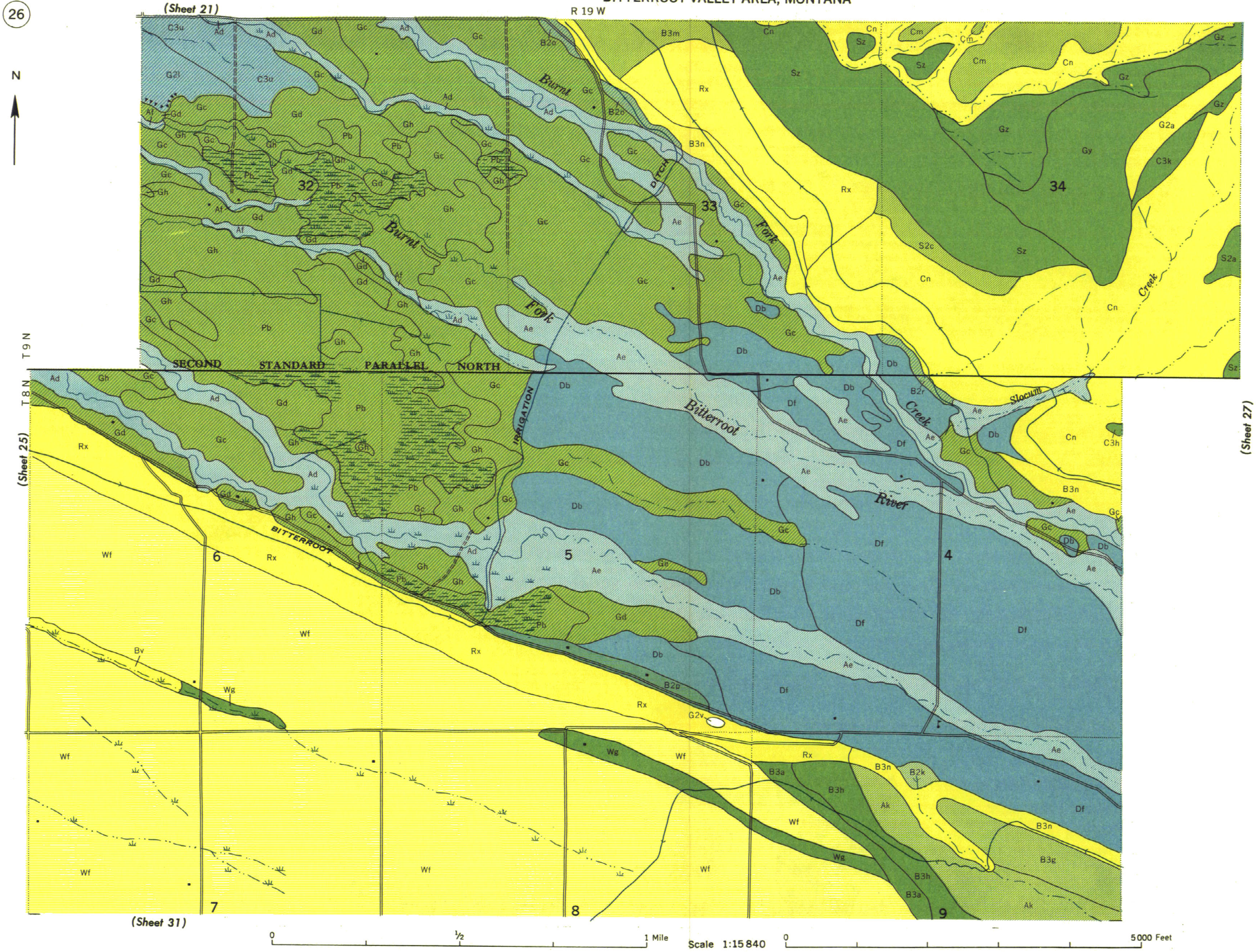

R 19 W
(Sheet 17)
N
T 9 N
(Sheet 20)
(Sheet 22)
(Sheet 26)
(Sheet 27)
17
16
15
14
20
21
22
23
29
28
27
26
BITTERROOT
IRRIGATION
DITCH
Burnt
Fork
Creek
Lower Burnt Fork School
We
Wf
Ta
Cm
Cn
Bv
B3p
B3r
B3t
S2c
S2a
C3k
Scale 1:15 840
0
1/2
1 Mile
5000 Feet


22
(Sheet 18)
R 19 W
R 18 W
N
(Sheet 21)
T 9 N
(Sheet 27)
BITTERROOT
NATIONAL
FOREST
NATIONAL FOREST BOUNDARY
Ambrose Creek
Slocum Creek
14
13
18
17
23
24
19
26
25
30
S2c
S2w
Sh
B2u
B2x
Wh
Bv
S2a
B2v
Ag
S2d
Sz
G2c
G2d
Ta
Hg
C3n
0
½
1 Mile
Scale 1:15 840
0
5000 Feet


R 21 W
R 20 W
(Sheet 19)
N
T 9 N
T 8 N
SECOND STANDARD PARALLEL NORTH
NATIONAL FOREST BOUNDARY
NATIONAL FOREST BOUNDARY
BITTERROOT GUIDE MERIDIAN
(Sheet 24)
(Sheet 28)
Silverthorn Creek
McCalla Creek
Indian Prairie
BITTERROOT NATIONAL FOREST
31
3
2
1
10
11
12
Wh
C3f
C3a
C3b
B2a
Sb
Bh
Sc
Ae
C3d
C3e
C2z
B2b
B2d
B2g
Ll
Bf
C2r
Be
Bk
Cg
Bd
Lm
Ve
Lc
Cv
Pg
Pd
C3g
Cz
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet

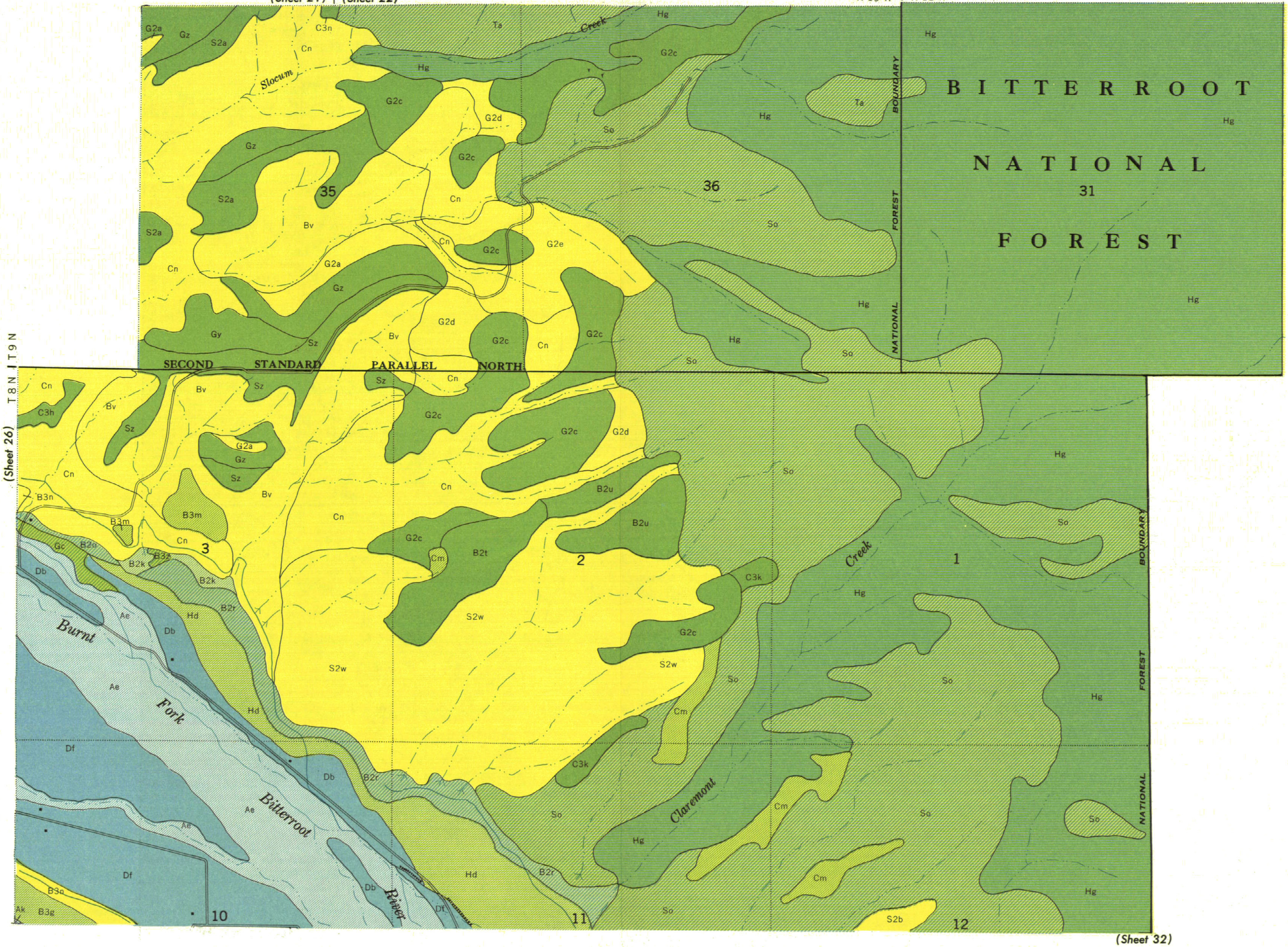

R 20 W
(Sheet 19) | (Sheet 20)
N
T 9 N
T 8 N
SECOND STANDARD PARALLEL NORTH
BITTERROOT GUIDE MERIDIAN
Silverthorn Creek
McCalla Creek
Indian Prairie
Curlew School
BITTERROOT RIVER
UNION DITCH
93
32
33
34
6
5
4
7
8
9
(Sheet 23)
(Sheet 25)
(Sheet 29)
0
½
1 Mile
Scale 1:15 840
0
5000 Feet


R 20 W
R 19 W
(Sheet 20)
(Sheet 24)
(Sheet 26)
(Sheet 30)
N
T 9 N
T 8 N
SECOND STANDARD PARALLEL NORTH
BITTERROOT GUIDE MERIDIAN
NORTHERN PACIFIC
UNION SUPPLY DITCH
BITTERROOT IRRIGATION DITCH
Burnt Fork Bitterroot River
35
36
31
3
2
1
10
11
12
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet


(Sheet 21)
R 19 W
N
T 9 N
T 8 N
(Sheet 25)
(Sheet 27)
(Sheet 31)
SECOND STANDARD PARALLEL NORTH
Burnt Fork
Burnt Fork
Burnt
Fork
DITCH
IRRIGATION
Bitterroot River
BITTERROOT
Slocum Creek
Creek
32
33
34
4
5
6
7
8
9
Scale 1:15 840
0
½
1 Mile
0
5000 Feet

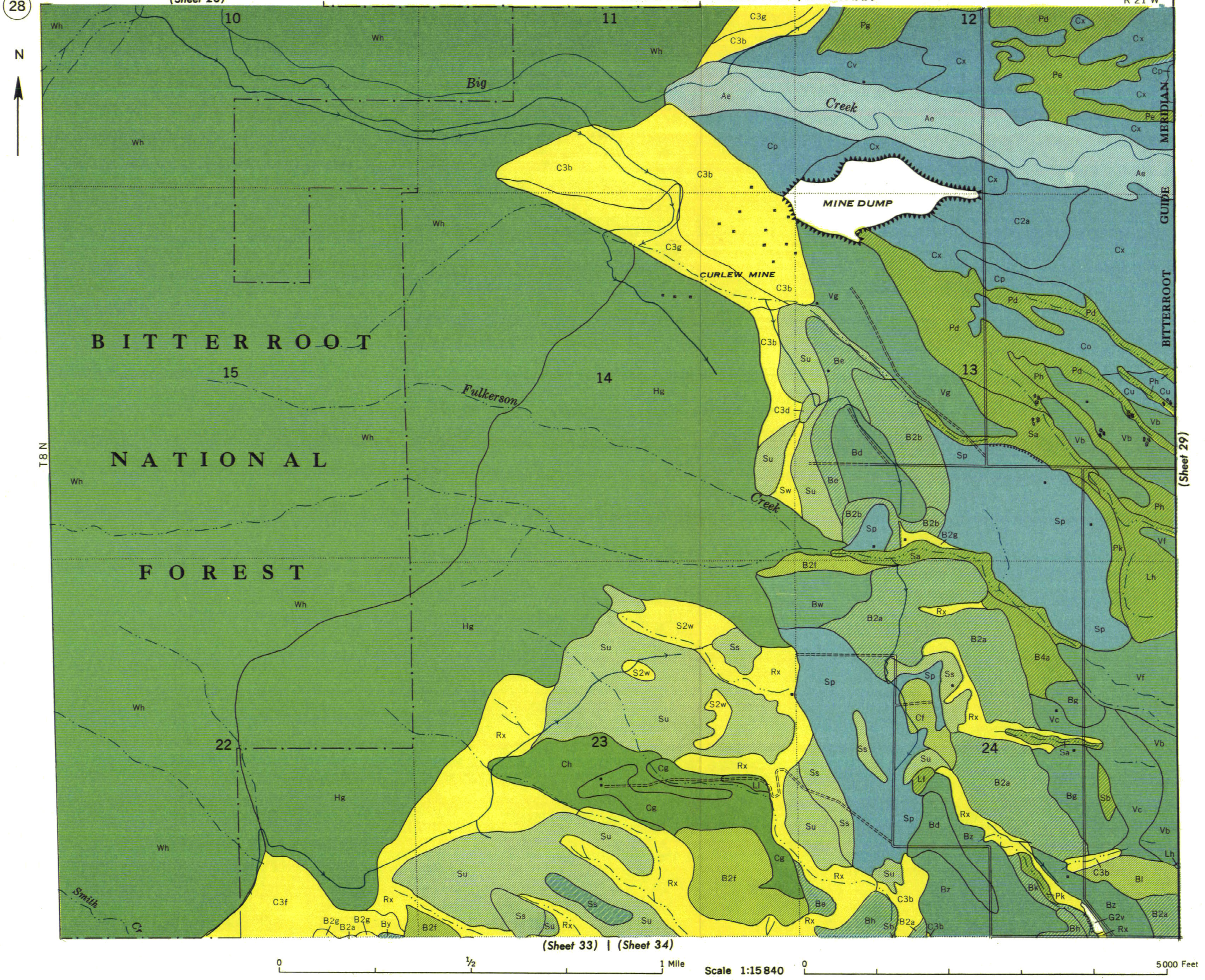
(Sheet 21) | (Sheet 22)

R 19 W | R 18 W

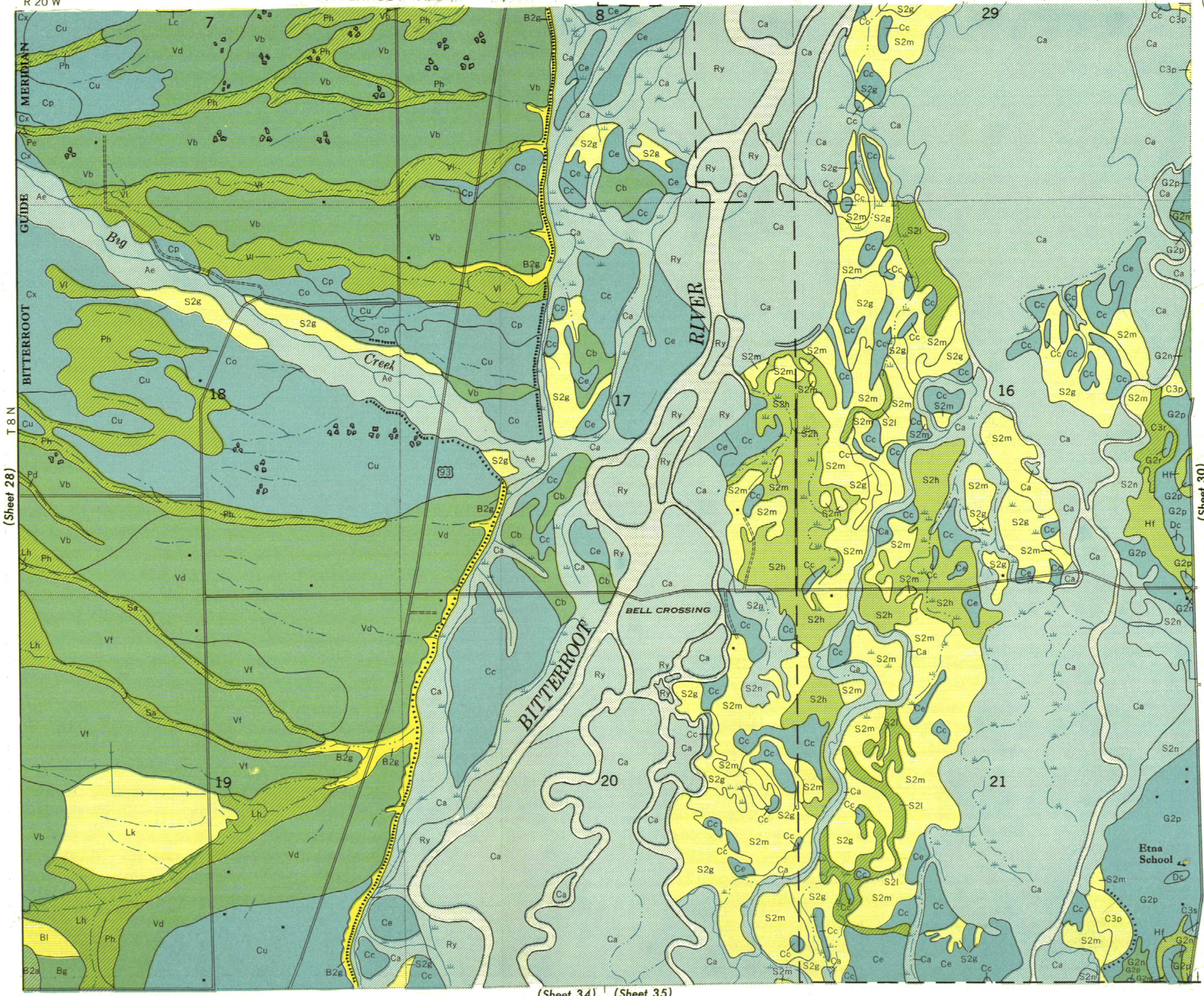


(Sheet 32)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

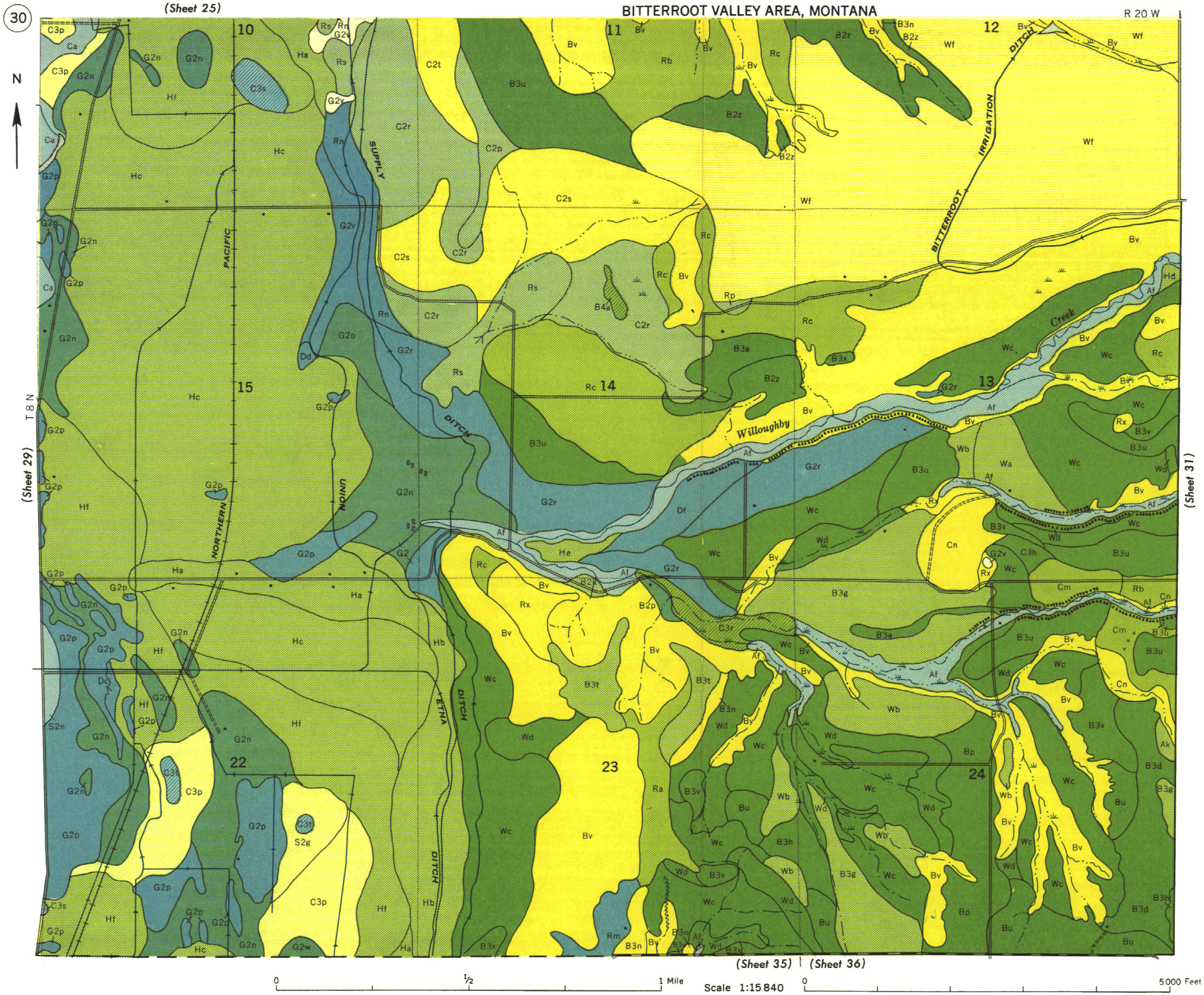

(Sheet 23)
R 21 W
N
T 8 N
BITTERROOT NATIONAL FOREST
Big Creek
Fulkerson Creek
Smith Cr.
CURLEW MINE
MINE DUMP
BITTERROOT GUIDE MERIDIAN
(Sheet 29)
(Sheet 33) | (Sheet 34)
10
11
12
13
14
15
22
23
24
Wh
Hg
C3g
C3b
C3d
C3f
Cv
Cx
Cp
Ae
Pe
Pd
Co
Ph
Cu
Vb
Vg
Sa
Sp
Su
Sw
Be
Bd
B2b
B2g
B2f
B2a
Bw
S2w
Ss
Rx
Ch
Cg
Lf
Cf
Vc
Bg
B4a
Vf
Lh
Pk
Bz
Bk
Bh
Bl
Sb
G2v
By
0
½
1 Mile
Scale 1:15840
0
5000 Feet

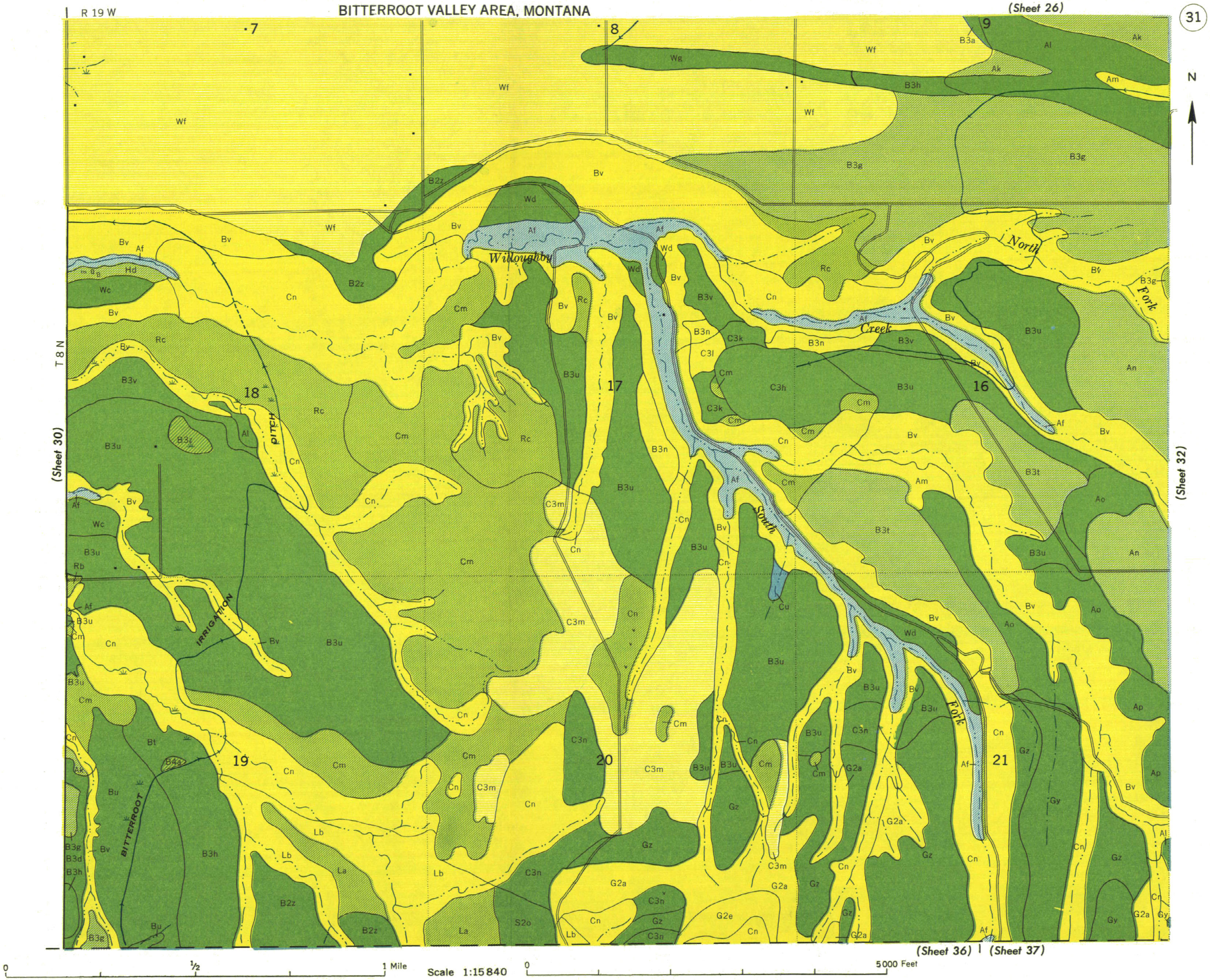
R 20 W



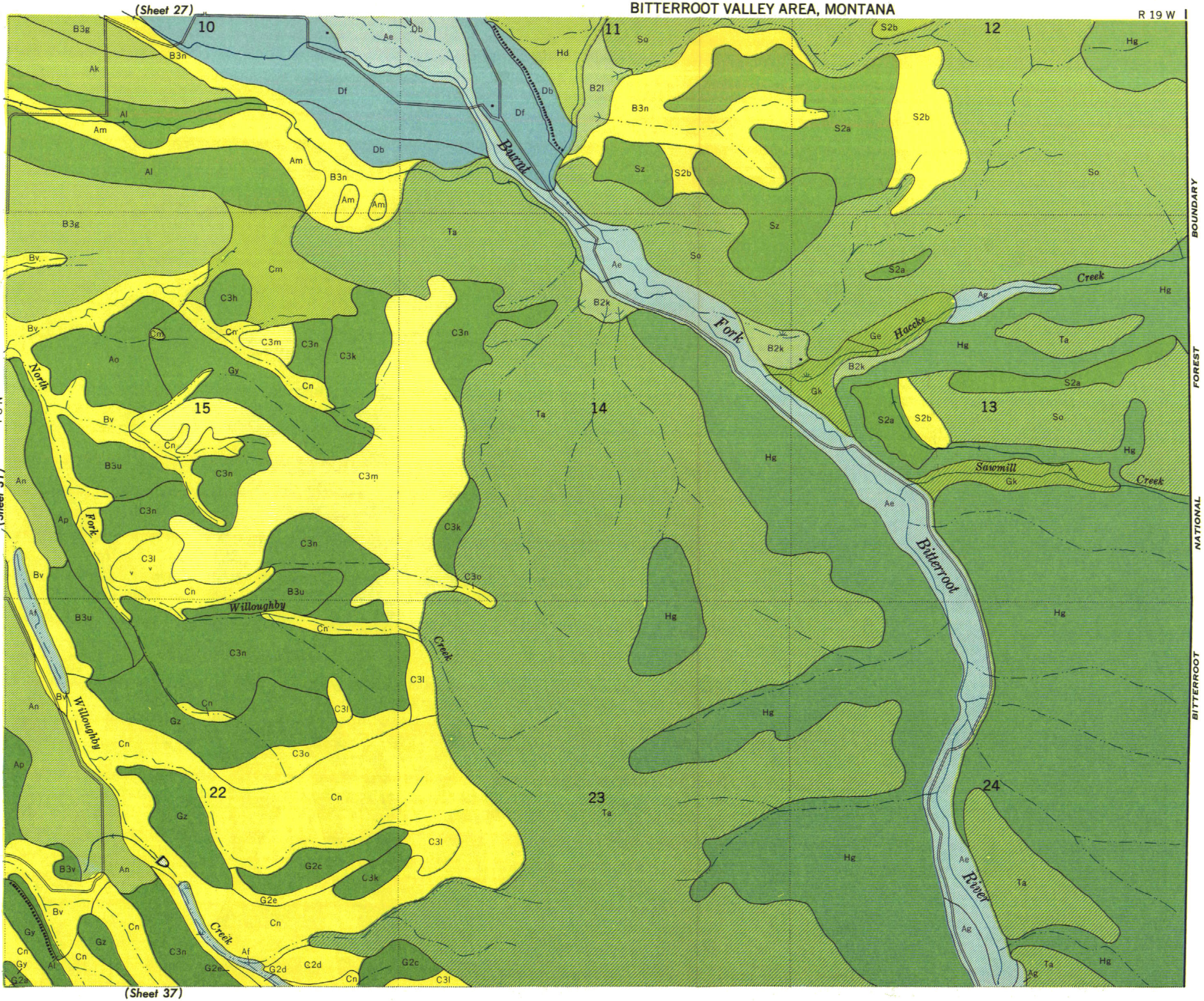
(Sheet 34) (Sheet 35)

0 ½ 1 Mile Scale 1:15840 0 5000 Feet


(Sheet 25)
R 20 W
N
T 8 N
(Sheet 29)
(Sheet 31)
(Sheet 35)
(Sheet 36)
10
11
12
13
14
15
22
23
24
NORTHERN PACIFIC
UNION
SUPPLY DITCH
ETNA DITCH
DITCH
BITTERROOT IRRIGATION DITCH
Willoughby Creek
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet

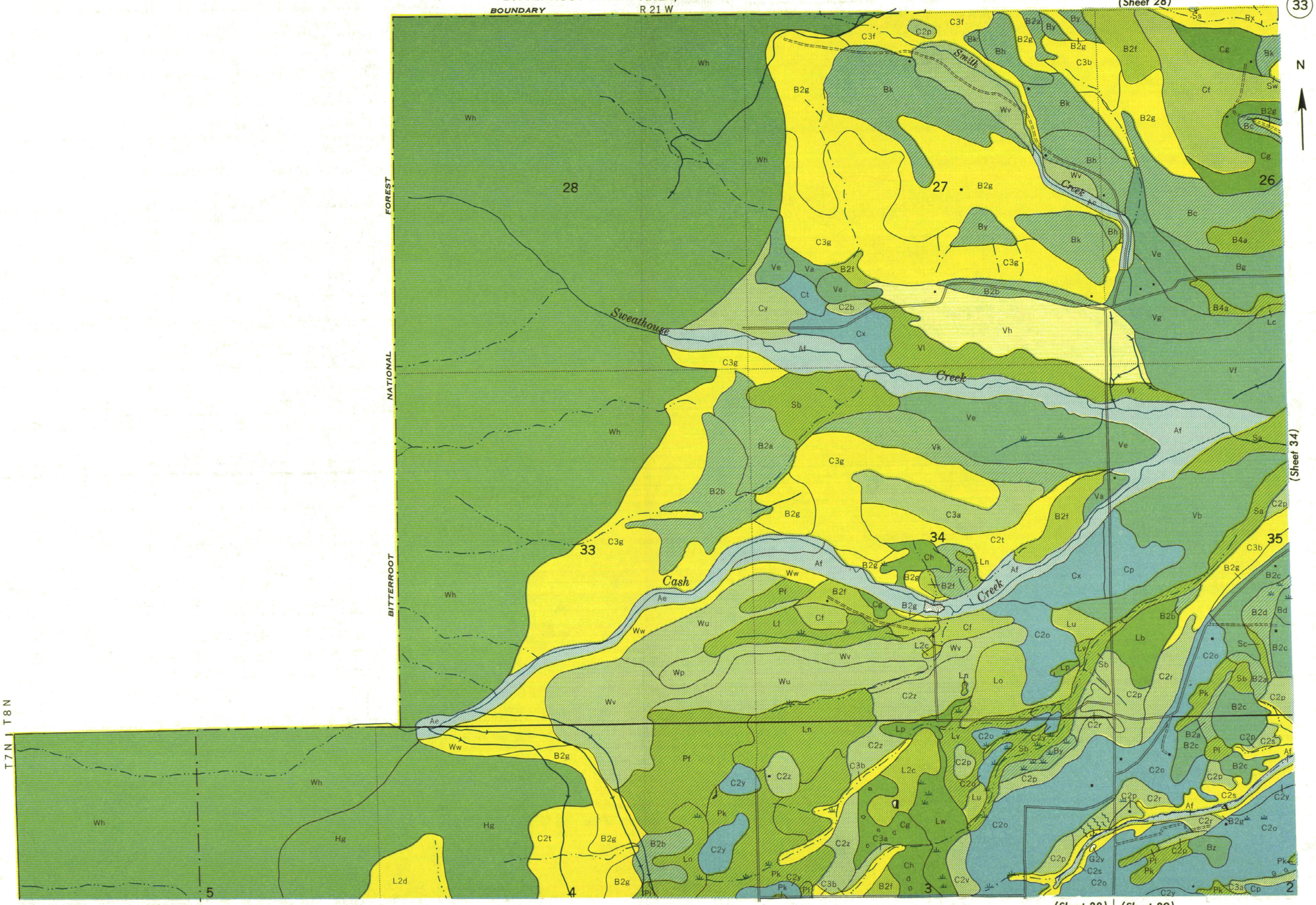

R 19 W
(Sheet 26)
N
T 8 N
(Sheet 30)
(Sheet 32)
(Sheet 36)
(Sheet 37)
7
8
9
16
17
18
19
20
21
Willoughby
North Fork Creek
South Fork
IRRIGATION DITCH
BITTERROOT
Wf
Wg
B3h
Al
Ak
Am
B3a
B3g
Bv
B2z
Wd
Af
Hd
Wc
Cn
Cm
Rc
B3v
B3n
C3k
C3l
C3h
B3u
B3t
An
Ao
Ap
C3m
Cu
Rb
Bt
B4a
Bu
Lb
La
B3d
S2o
C3n
Gz
G2a
G2e
Gy
Scale 1:15840
0
½
1 Mile
5000 Feet

BITTERROOT VALLEY AREA, MONTANA

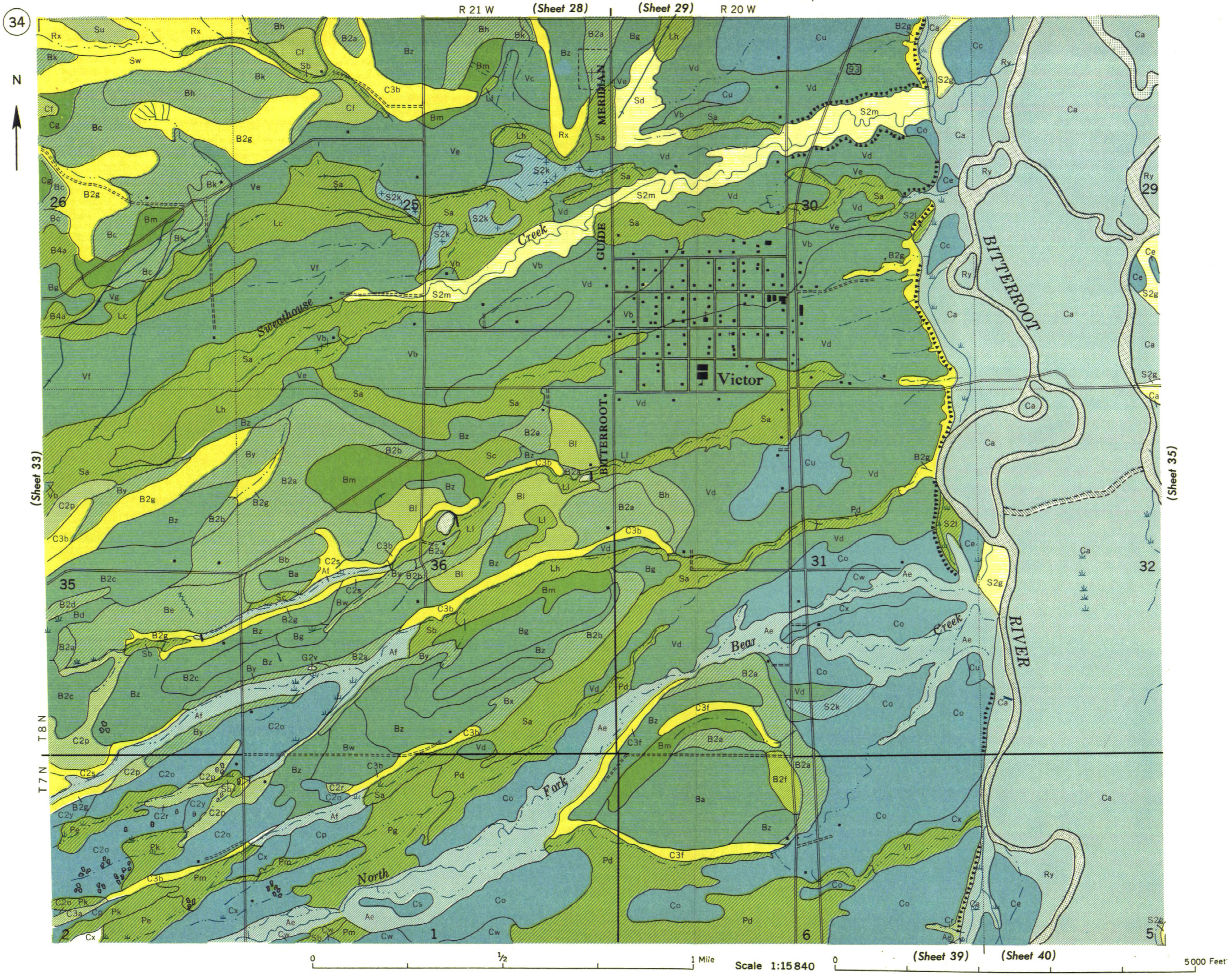


0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

BITTERROOT VALLEY AREA, MONTANA



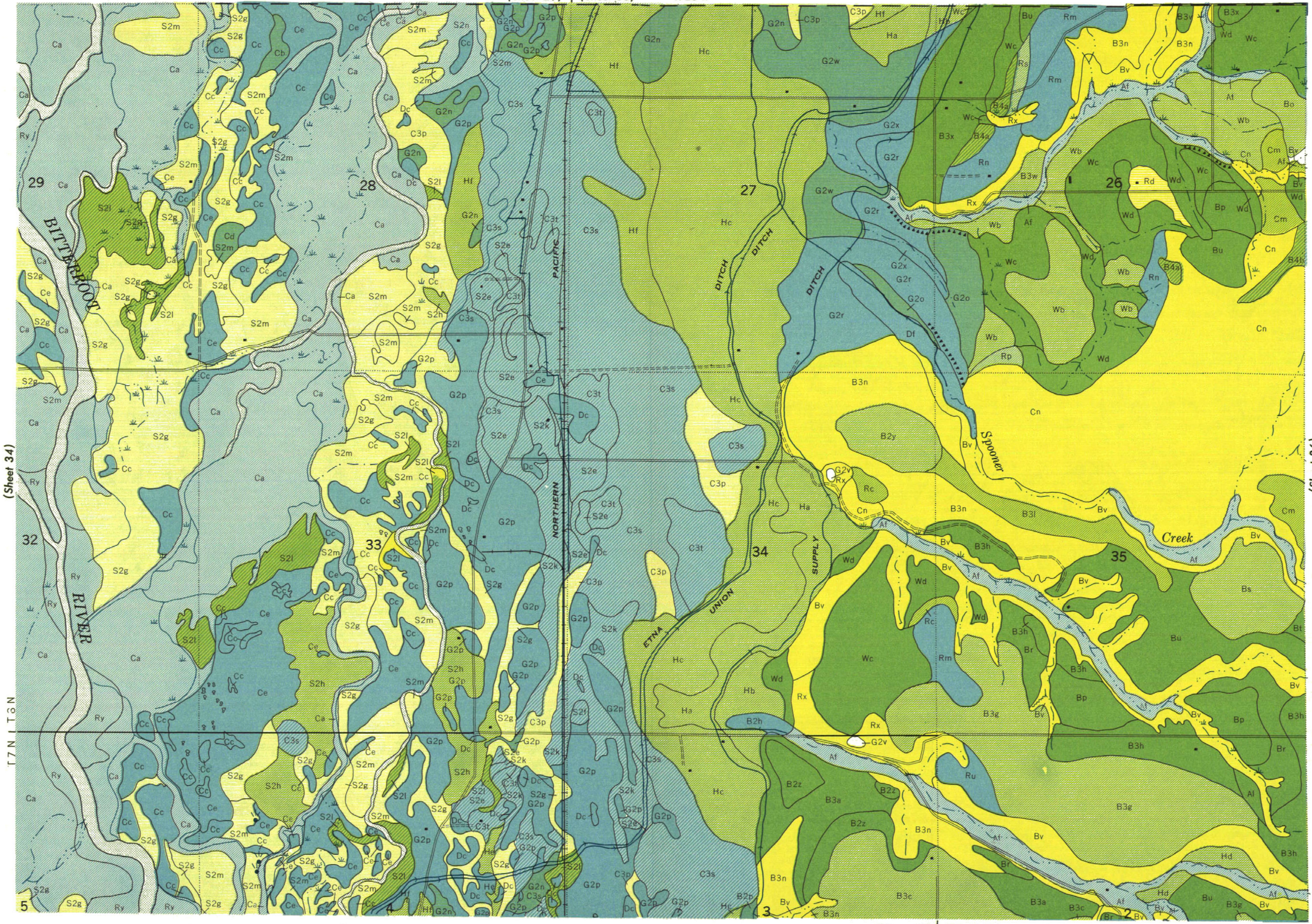
0 1/2 1 Mile Scale 1:15 840 0 5000 Feet


N
R 21 W
(Sheet 28)
(Sheet 29)
R 20 W
(Sheet 33)
(Sheet 35)
(Sheet 39)
(Sheet 40)
T 8 N
T 7 N
Victor
BITTERROOT
RIVER
Sweathouse
Creek
Bear
Creek
North
Fork
GUIDE
MERIDIAN
BITTERROOT
93
26
25
30
29
35
36
31
32
2
1
6
5
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

(Sheet 29) | (Sheet 30) R 20 W

(Sheet 34)

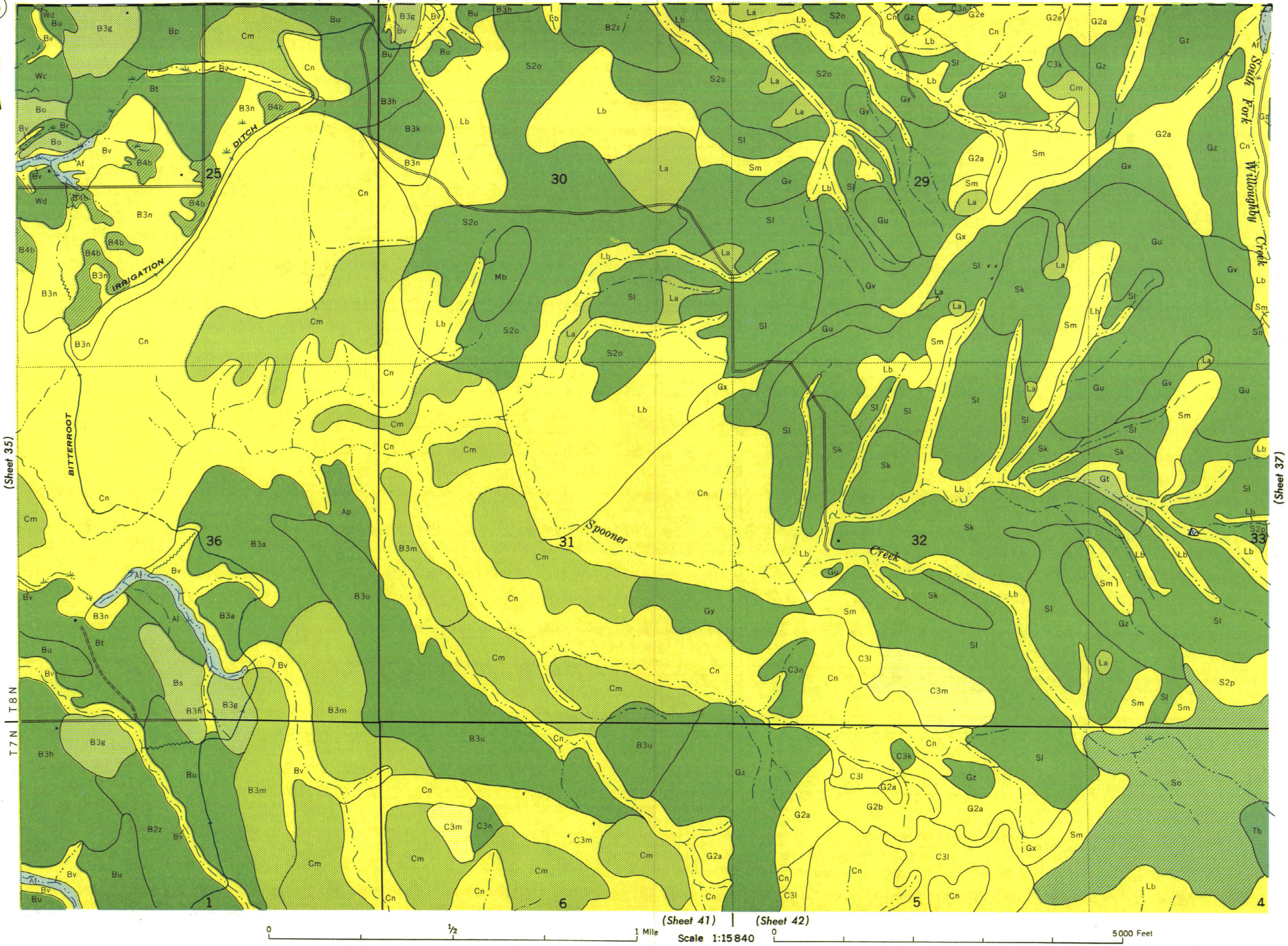
T 7 N | T 6 N

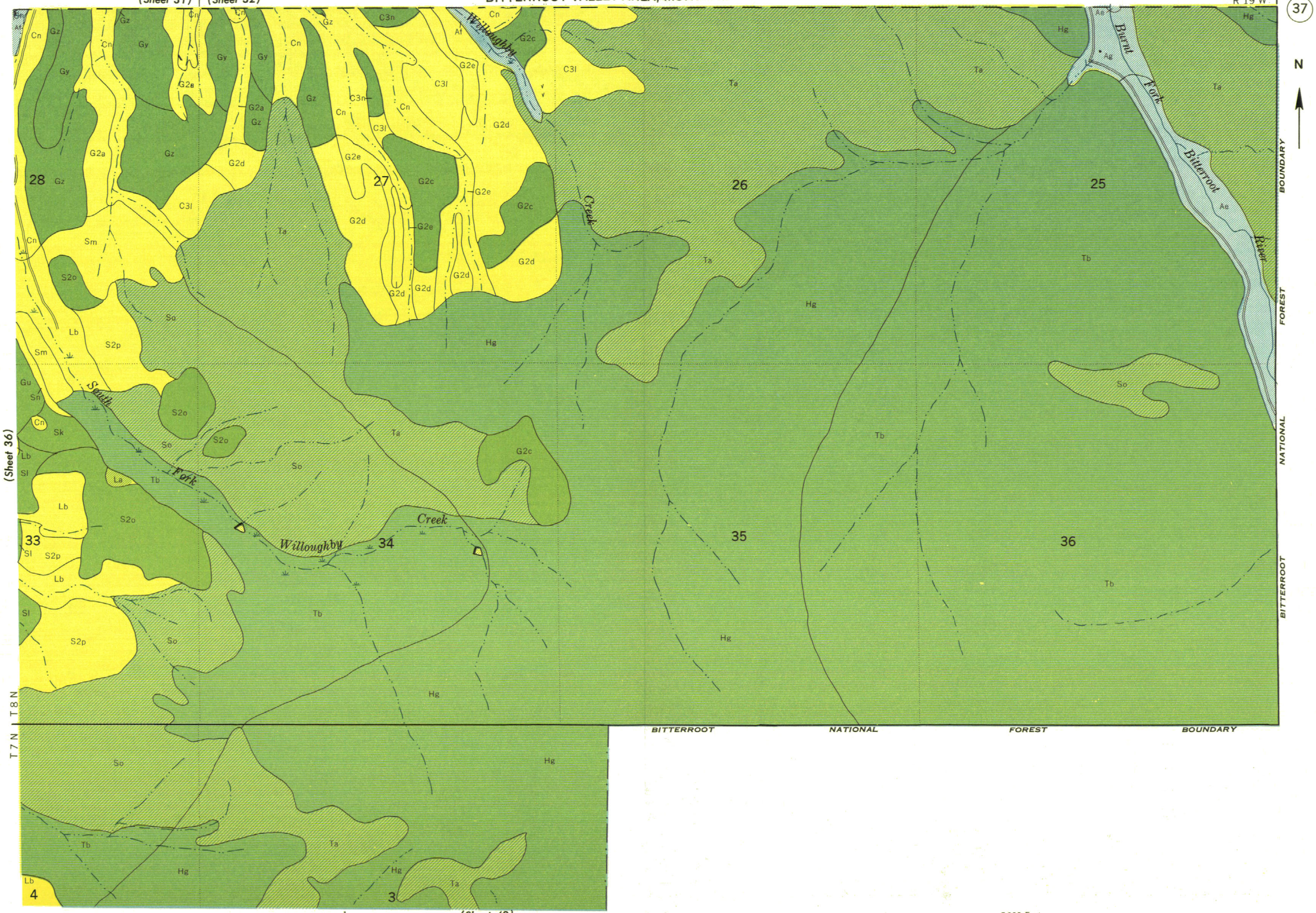


(Sheet 36)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

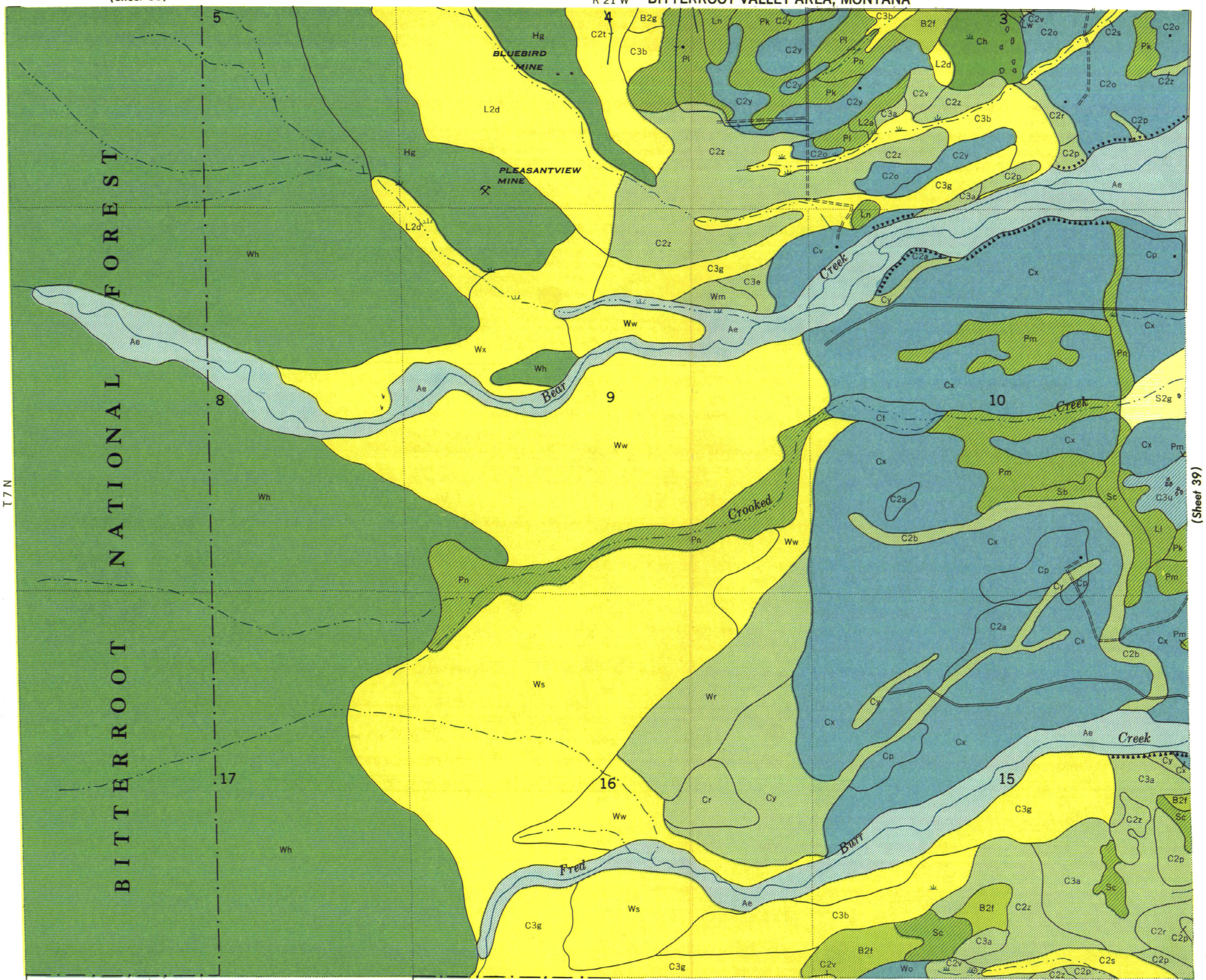
(Sheet 40) | (Sheet 41)


R 20 W
(Sheet 30)
(Sheet 31)
R 19 W
N
(Sheet 35)
(Sheet 37)
(Sheet 41)
(Sheet 42)
T 8 N
T 7 N
IRRIGATION
DITCH
BITTERROOT
Spooner
Creek
South Fork
Willoughby
Creek
25
30
29
36
31
32
33
1
6
5
4
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet



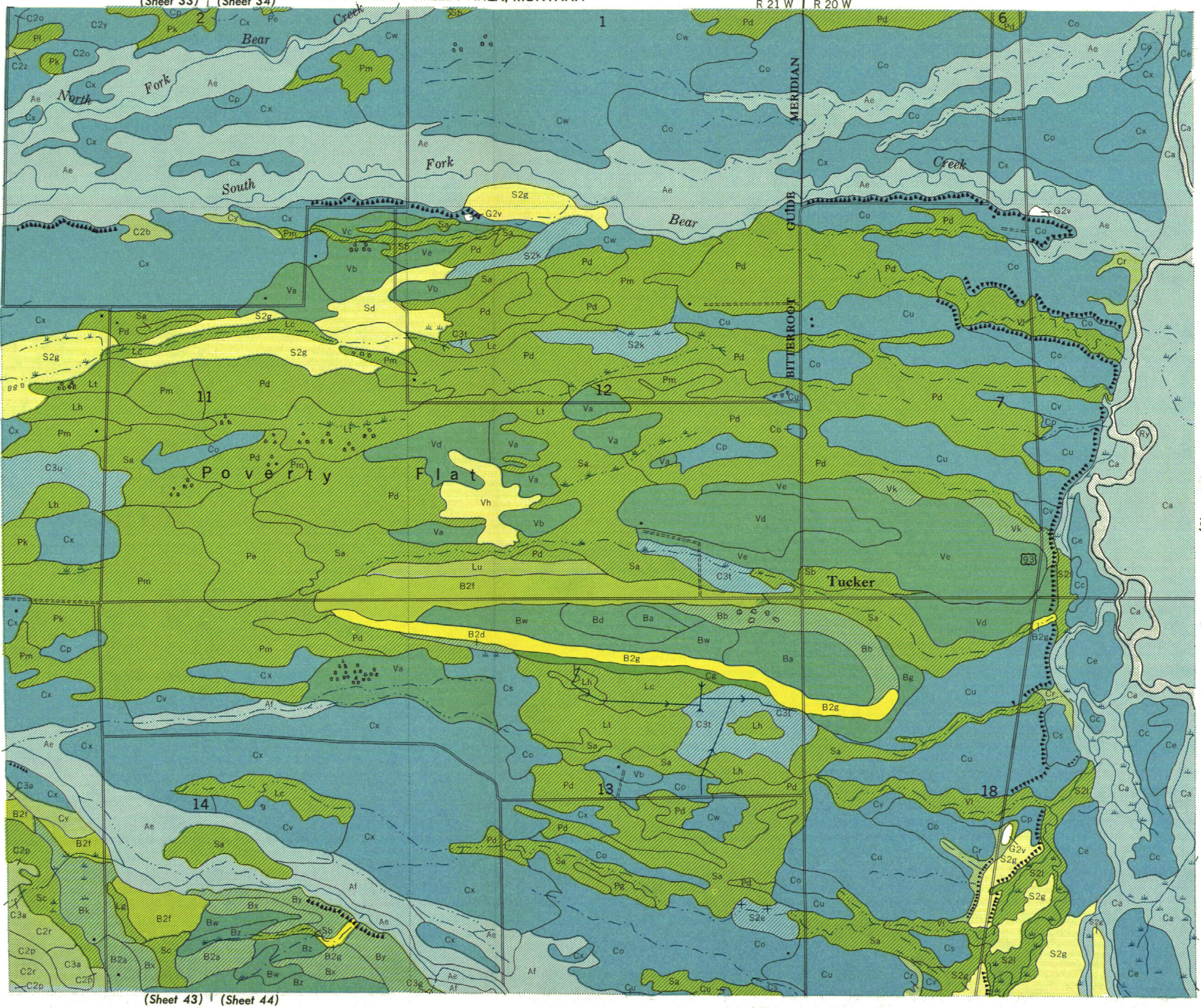
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Sheet 33)

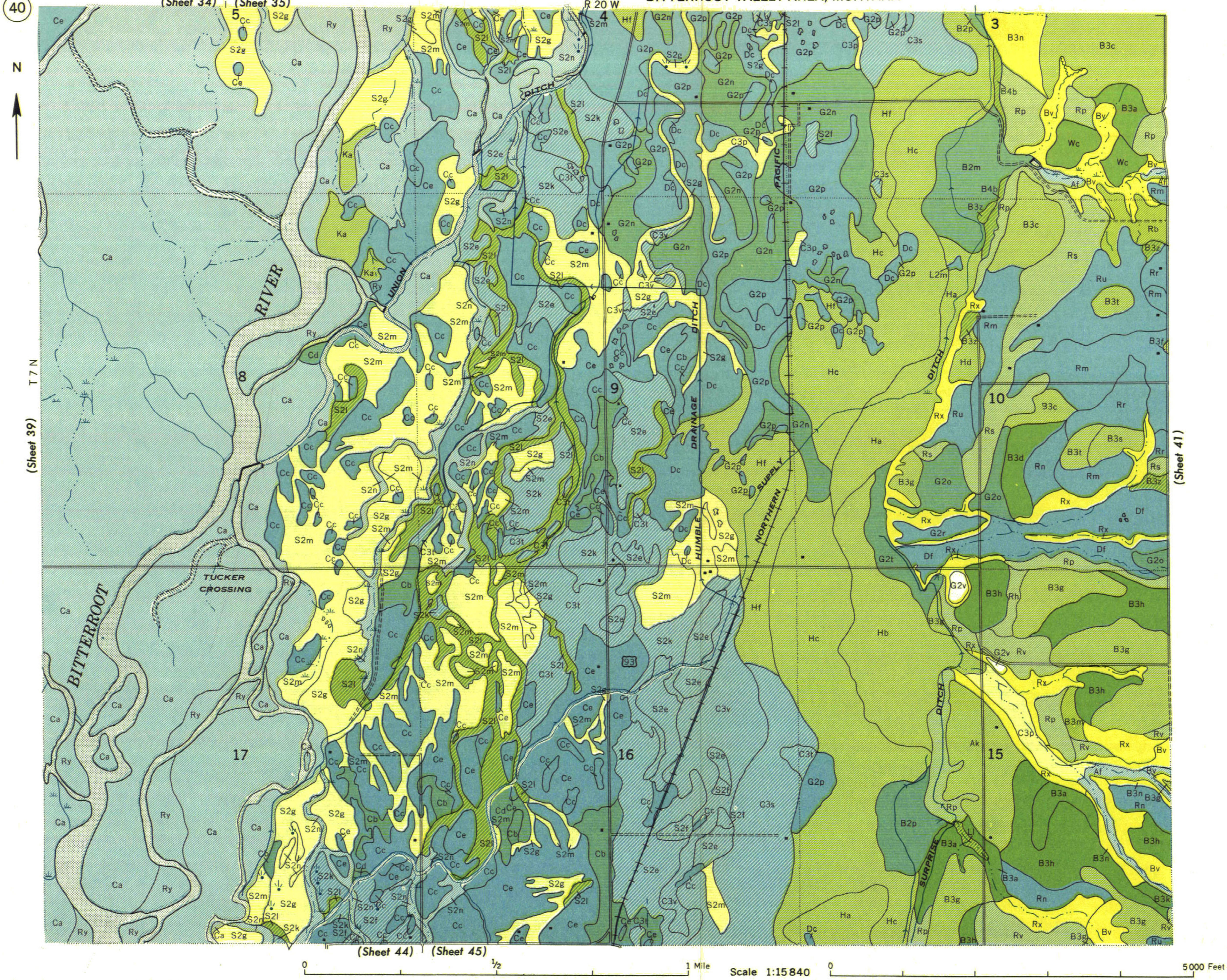


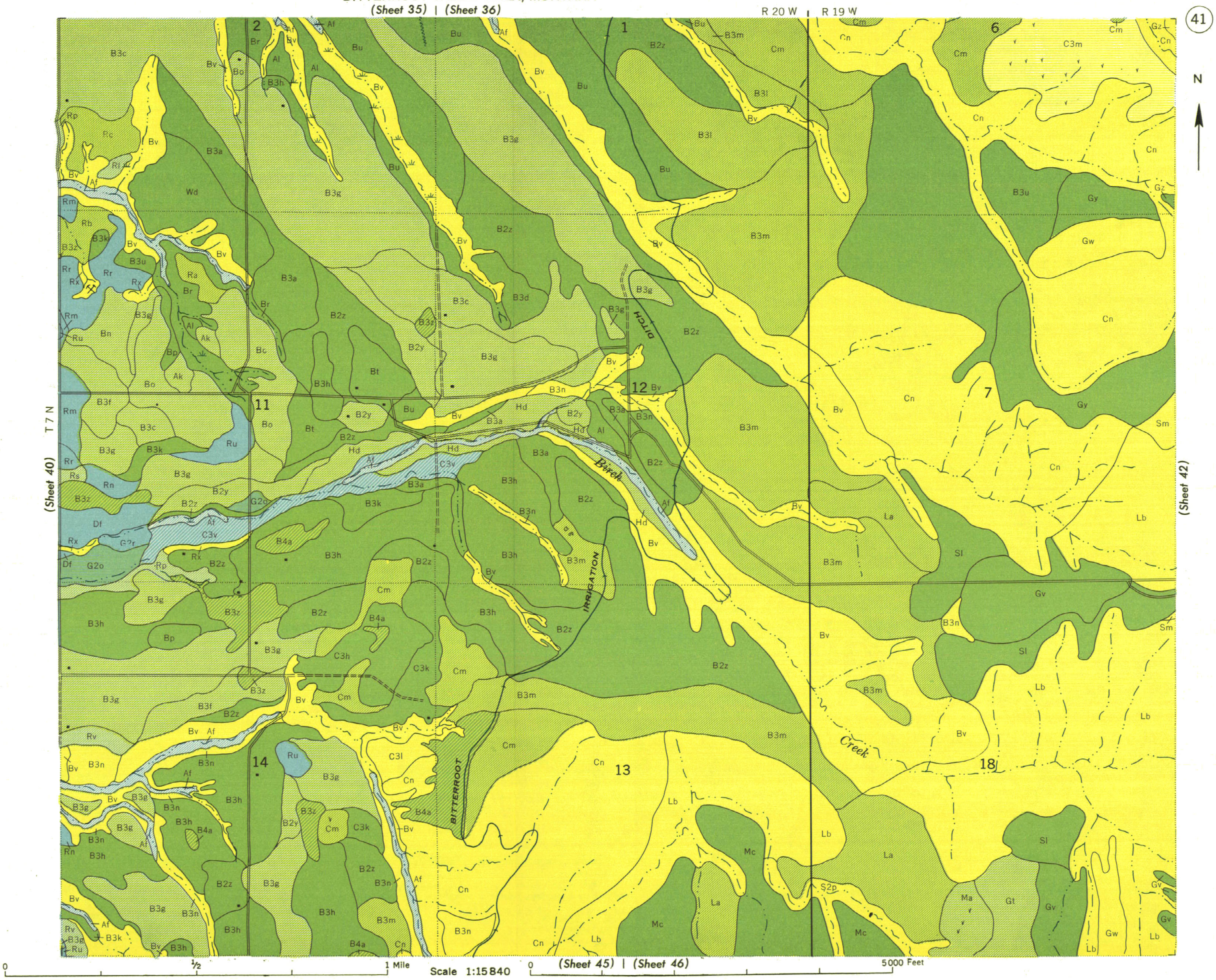
(Sheet 43)

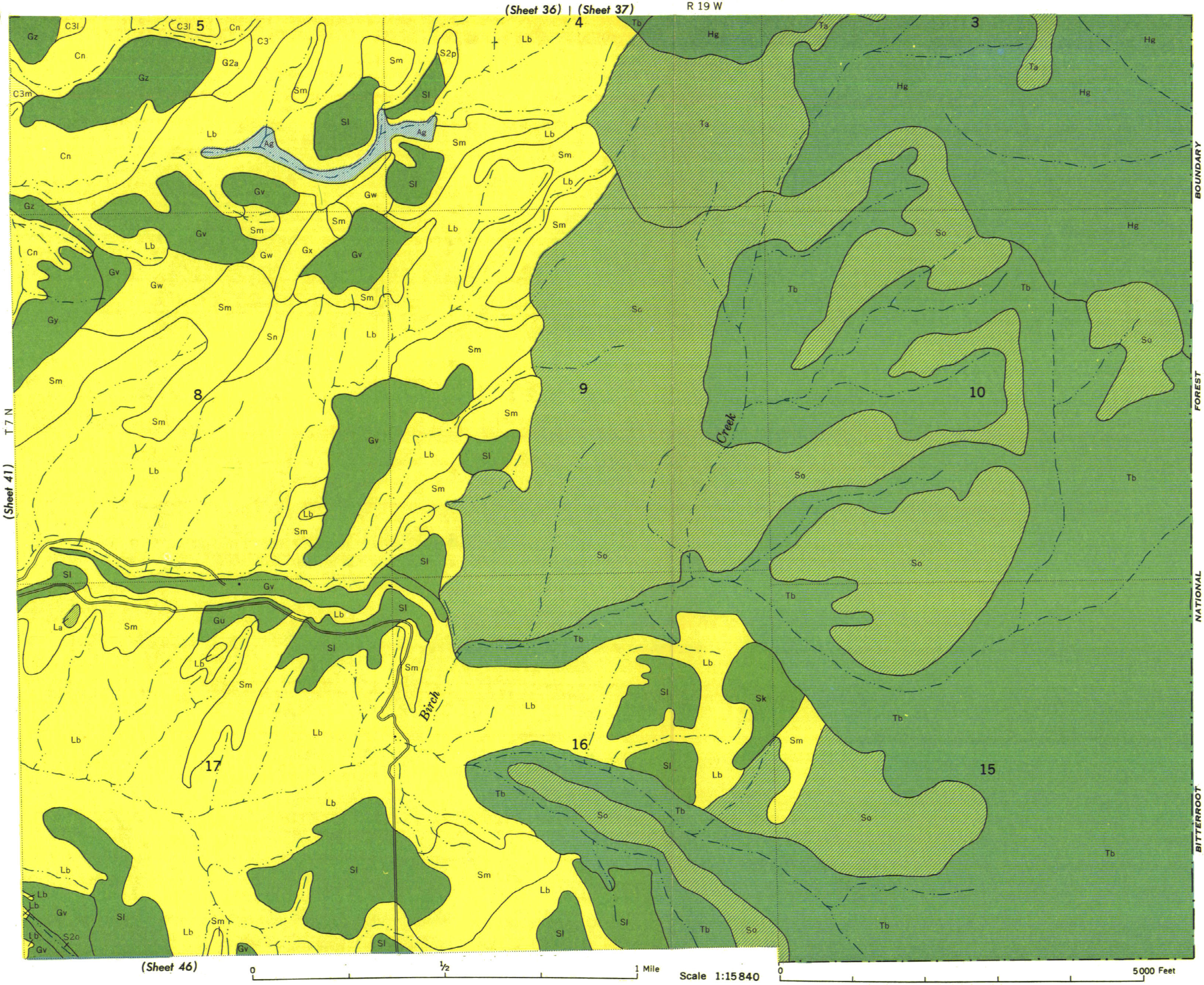
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

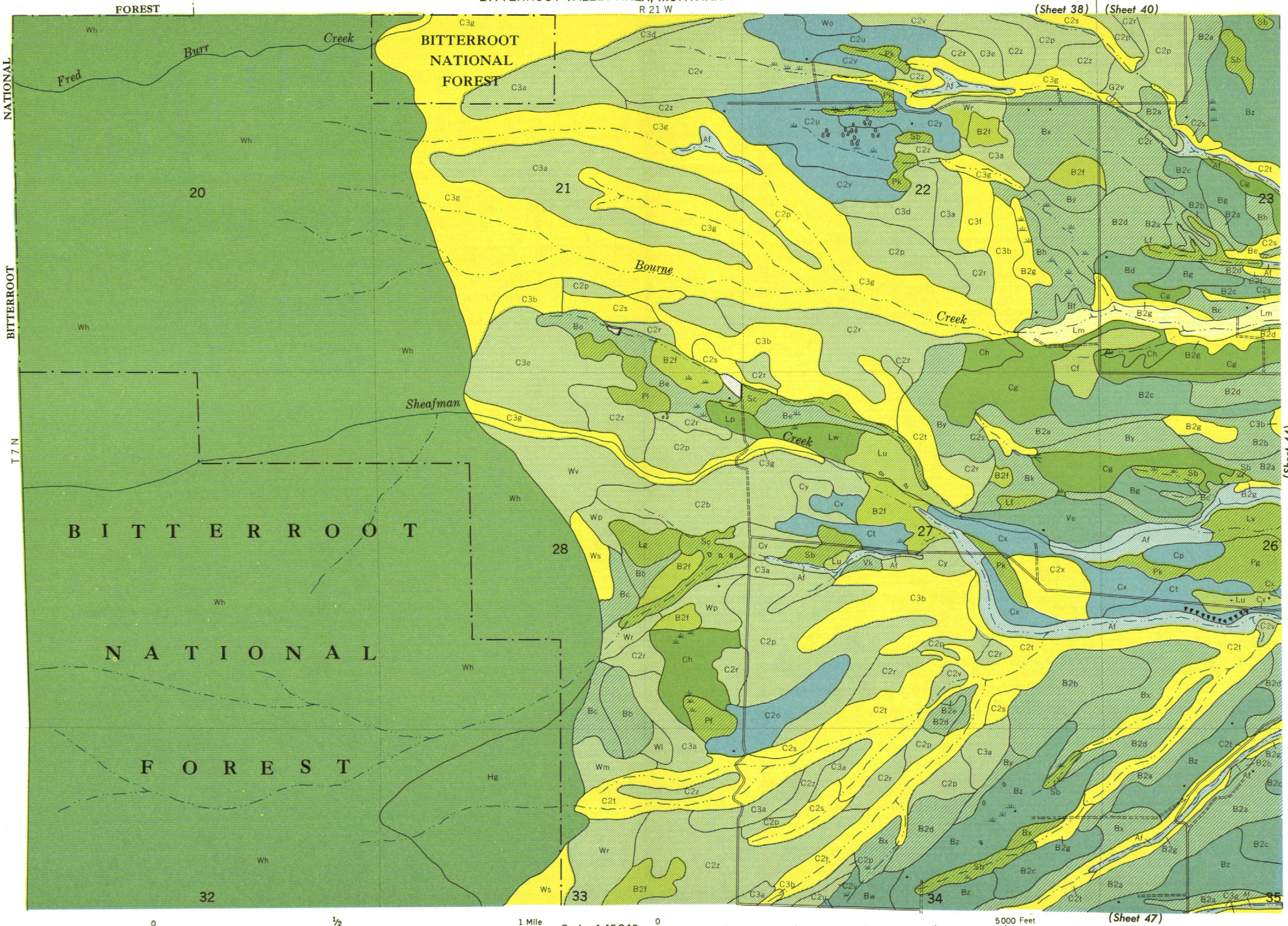


0 ½ 1 Mile Scale 1:15840 0 5000 Feet

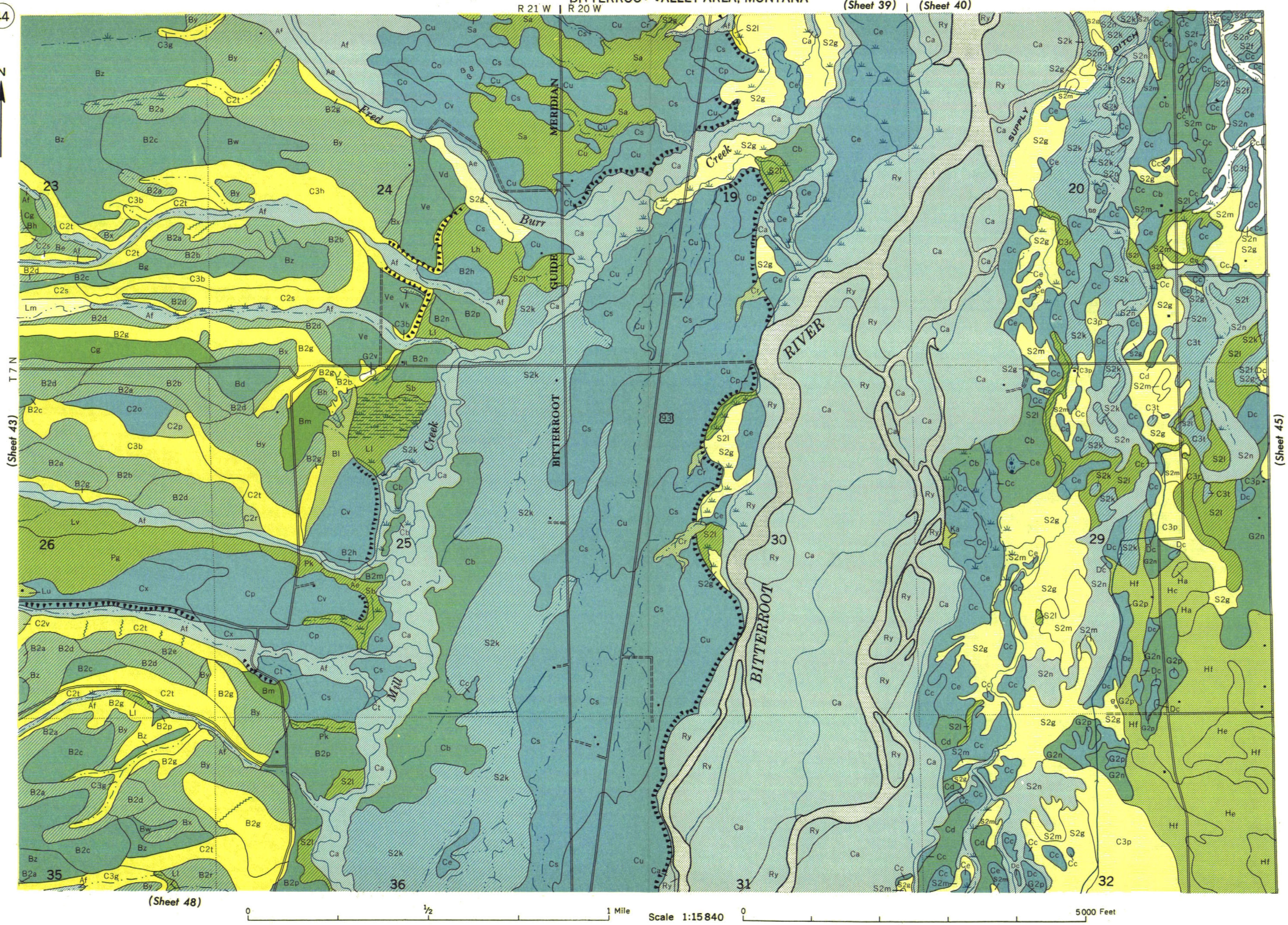

(Sheet 34)
(Sheet 35)
R 20 W
N
T 7 N
(Sheet 39)
(Sheet 41)
(Sheet 44)
(Sheet 45)
BITTERROOT
RIVER
TUCKER CROSSING
UNION
DITCH
DRAINAGE DITCH
HUMBLE DITCH
NORTHERN PACIFIC
SUPPLY DITCH
SURPRISE DITCH
93
0
½
1 Mile
Scale 1:15840
5000 Feet

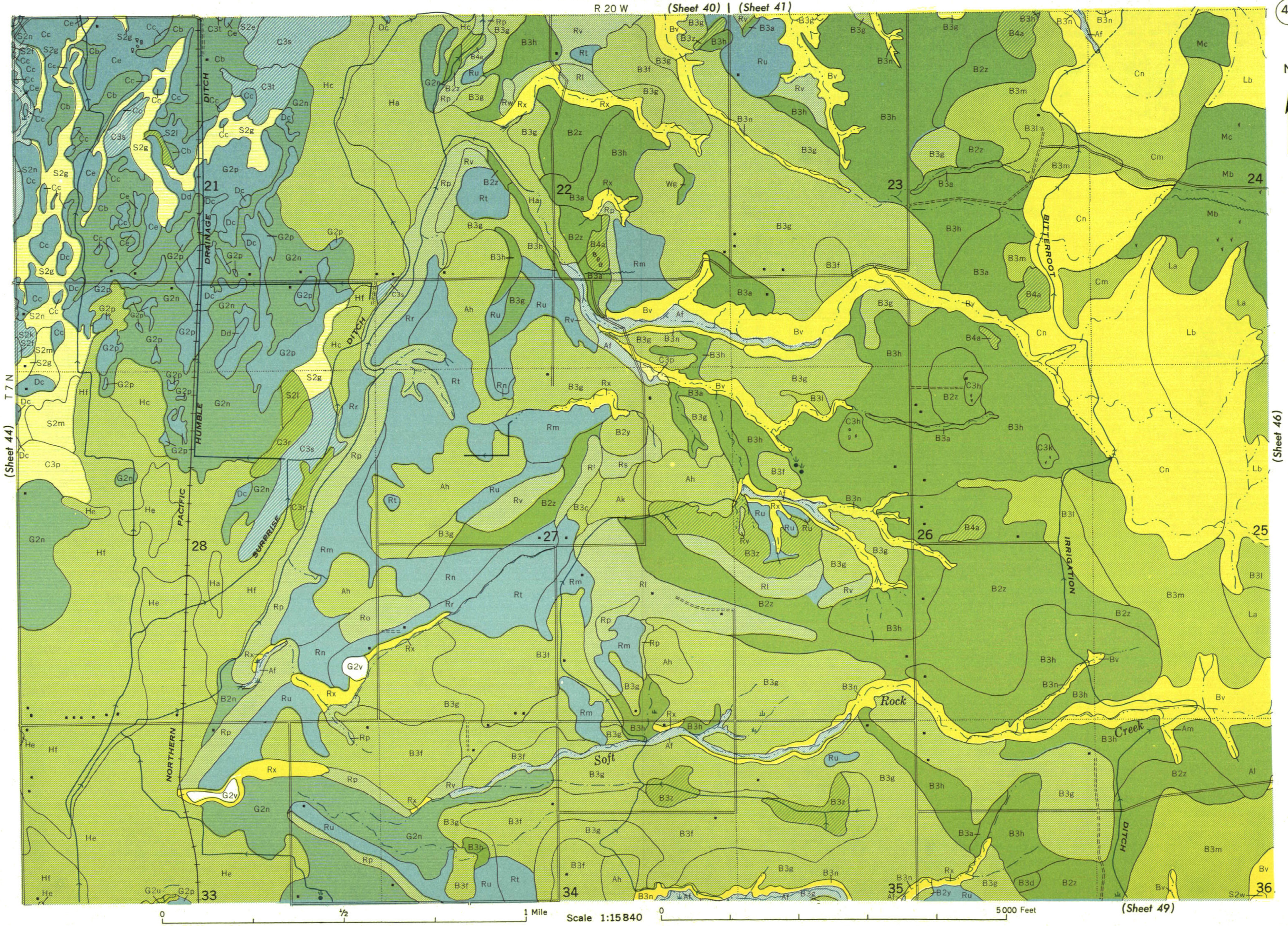

(Sheet 35) | (Sheet 36)
R 20 W | R 19 W
N
T 7 N
(Sheet 40)
(Sheet 42)
1
2
6
7
11
12
13
14
18
Birch
Creek
IRRIGATION
DITCH
BITTERROOT
(Sheet 45) | (Sheet 46)
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

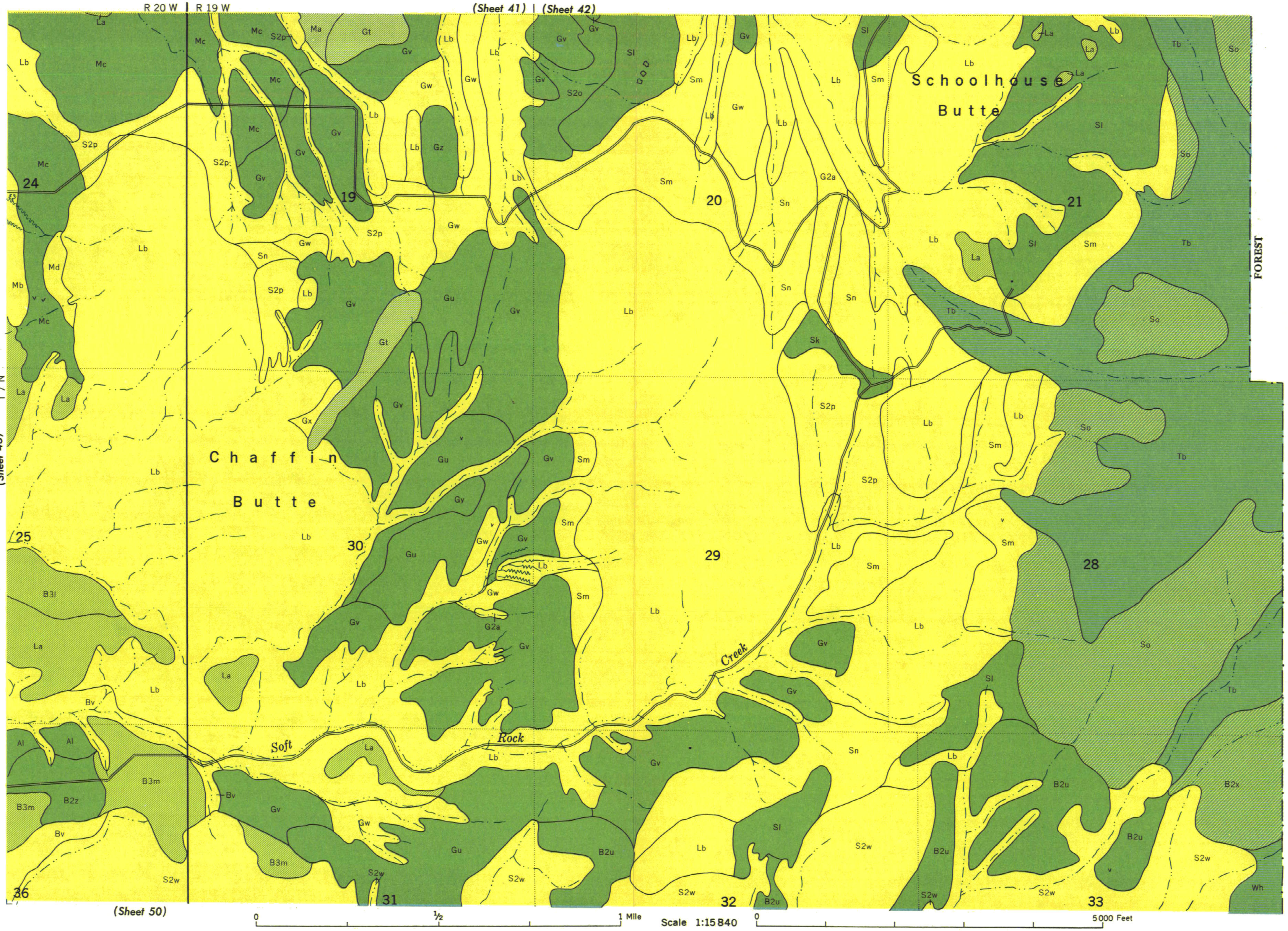

(Sheet 36) | (Sheet 37)
R 19 W
N
T 7 N
(Sheet 41)
(Sheet 46)
BITTERROOT NATIONAL FOREST BOUNDARY
Birch
Creek
3
4
5
8
9
10
15
16
17
Gz
C3l
Cn
C3
C3m
G2a
Gv
Gw
Gx
Gy
Gu
Ag
Lb
La
Sm
Sl
Sn
Sk
So
S2p
S2o
Tb
Ta
Hg
0
1/2
1 Mile
Scale 1:15840
0
5000 Feet

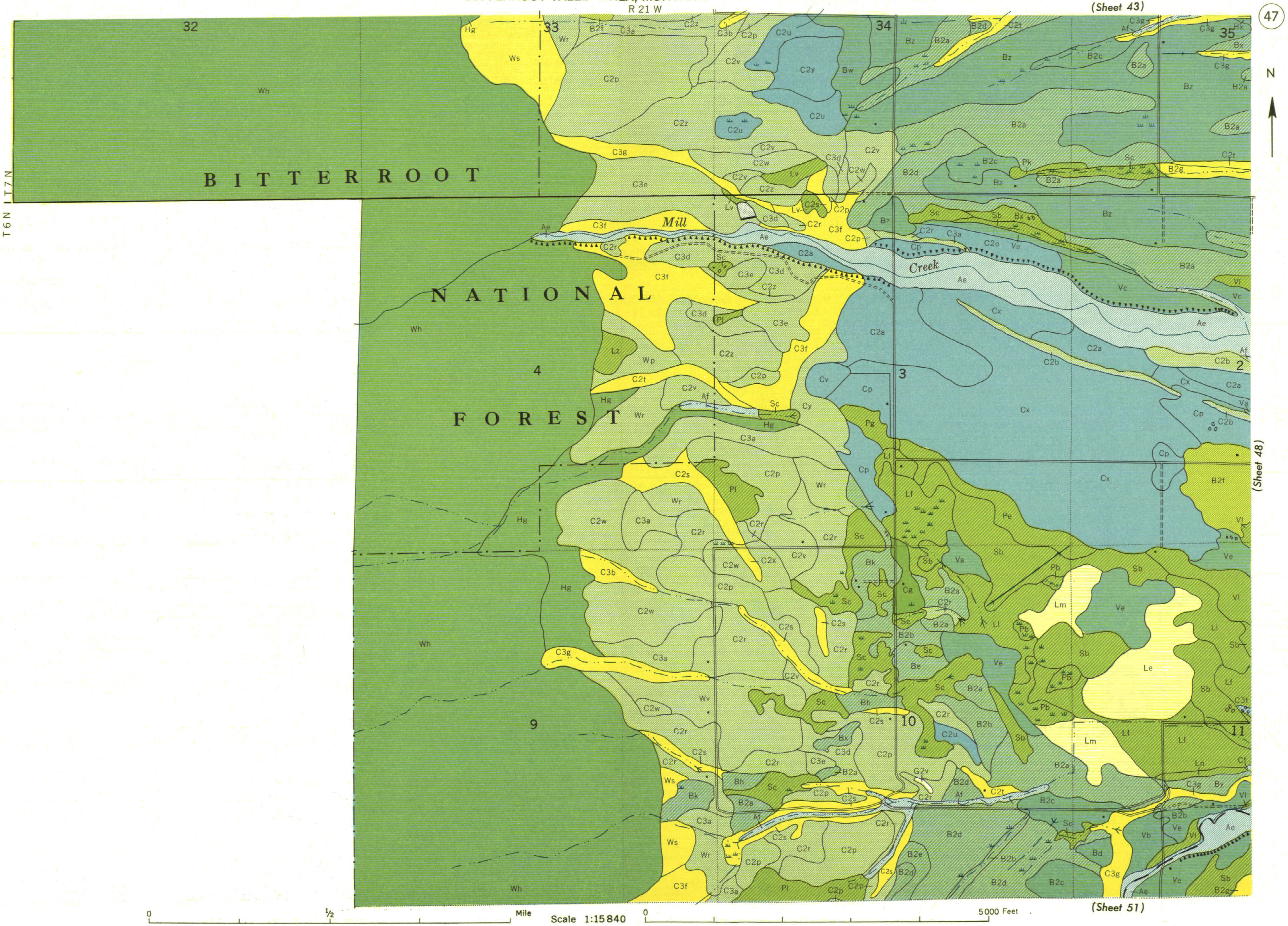


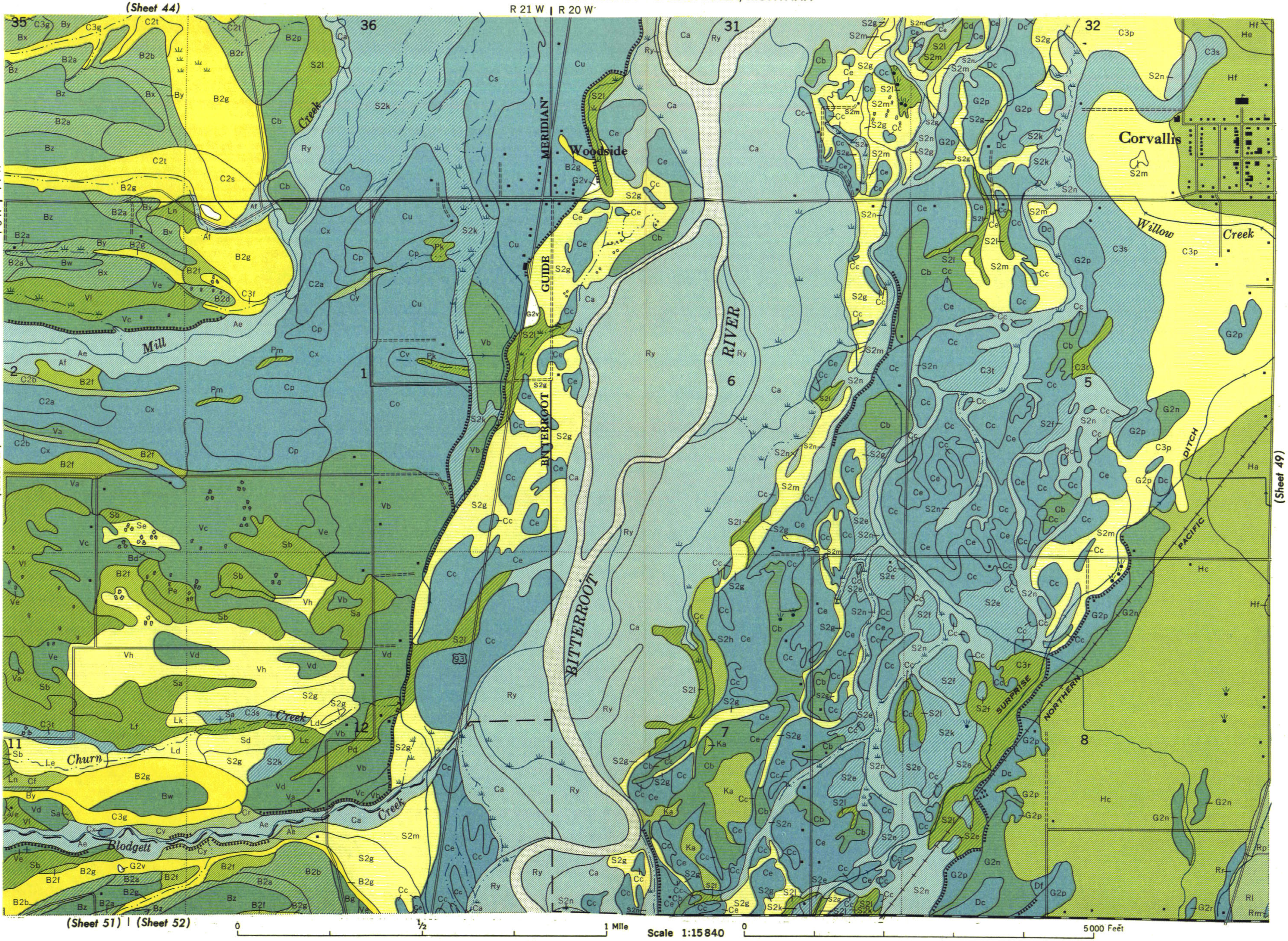
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

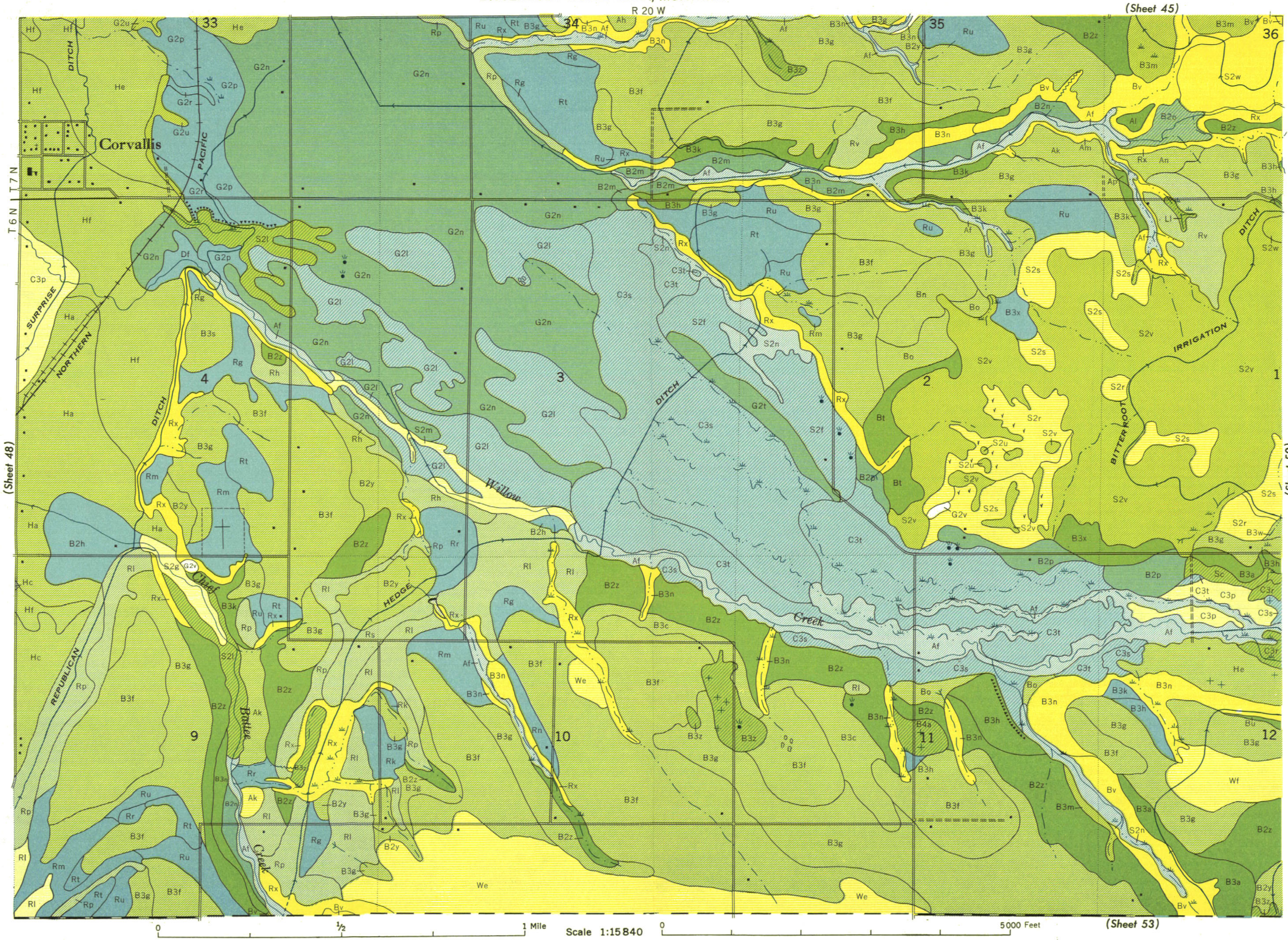

R 21 W | R 20 W
(Sheet 39) | (Sheet 40)
(Sheet 43)
(Sheet 45)
(Sheet 48)
T 7 N
N
MERIDIAN
GUIDE
BITTERROOT
Fred
Burr
Creek
Mill
Creek
BITTERROOT
RIVER
SUPPLY
DITCH
93
23
24
19
20
26
25
30
29
35
36
31
32
Scale 1:15 840
0 1/2 1 Mile
0 5000 Feet

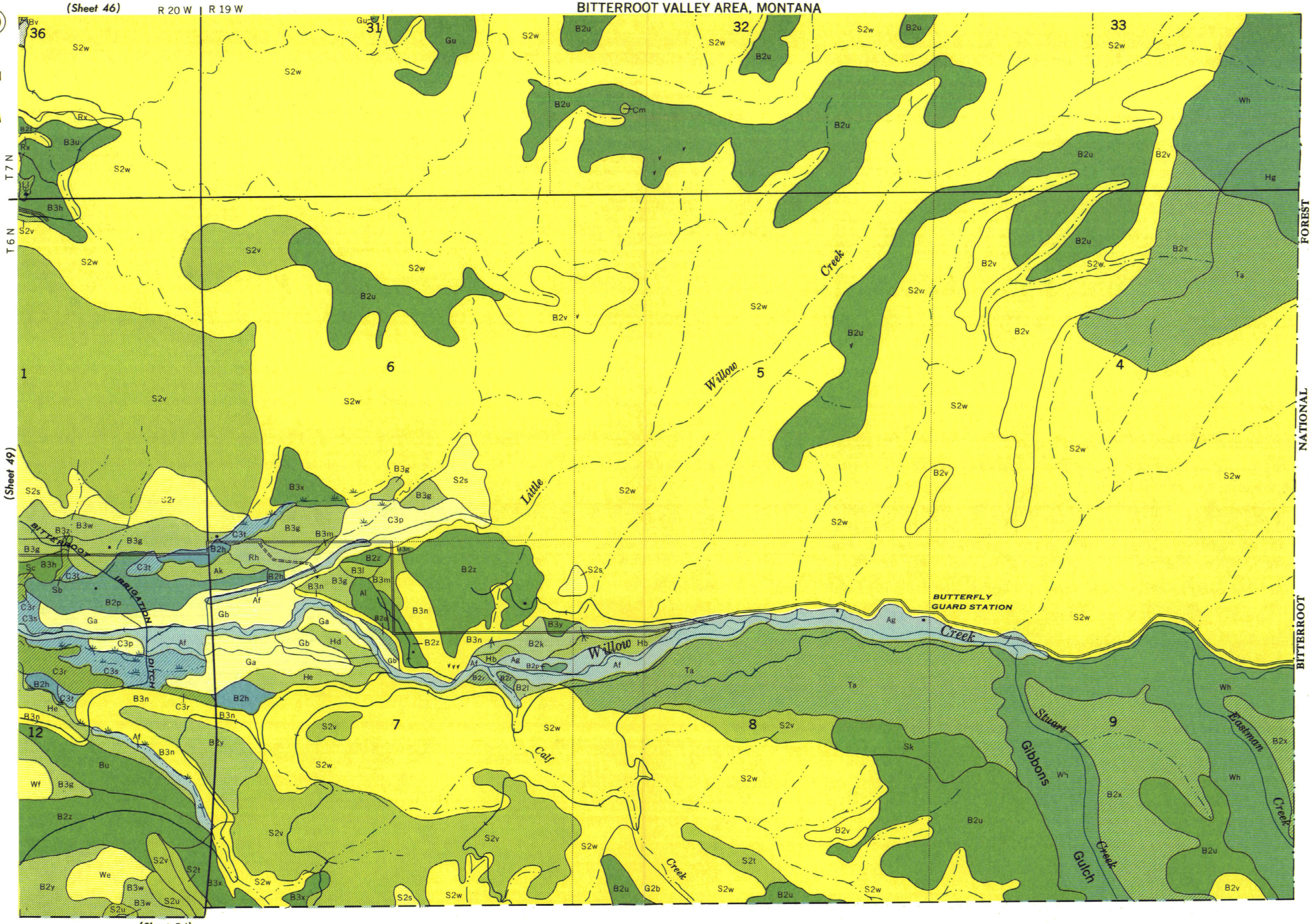

R 20 W
(Sheet 40) | (Sheet 41)
N
(Sheet 44)
(Sheet 46)
(Sheet 49)
T 7 N
21
22
23
24
25
26
27
28
33
34
35
36
DRAINAGE
DITCH
HUMBLE
DITCH
SURPRISE
PACIFIC
NORTHERN
BITTERROOT
IRRIGATION
DITCH
Rock
Creek
Soft
0
½
1 Mile
Scale 1:15 840
0
5000 Feet


R 20 W
R 19 W
(Sheet 41)
(Sheet 42)
N
Schoolhouse
Butte
Chaffin
Butte
Soft
Rock
Creek
T 7 N
(Sheet 45)
(Sheet 50)
FOREST
NATIONAL
BITTERROOT
24
19
20
21
25
30
29
28
36
31
32
33
La
Lb
Mc
Ma
Gt
Gv
Gw
Gz
Gu
Gy
Gx
G2a
S2p
S2o
S2w
Sm
Sl
Sn
Sk
So
Tb
Md
Mb
B3l
B3m
B2z
B2u
B2x
Bv
Al
Wh
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

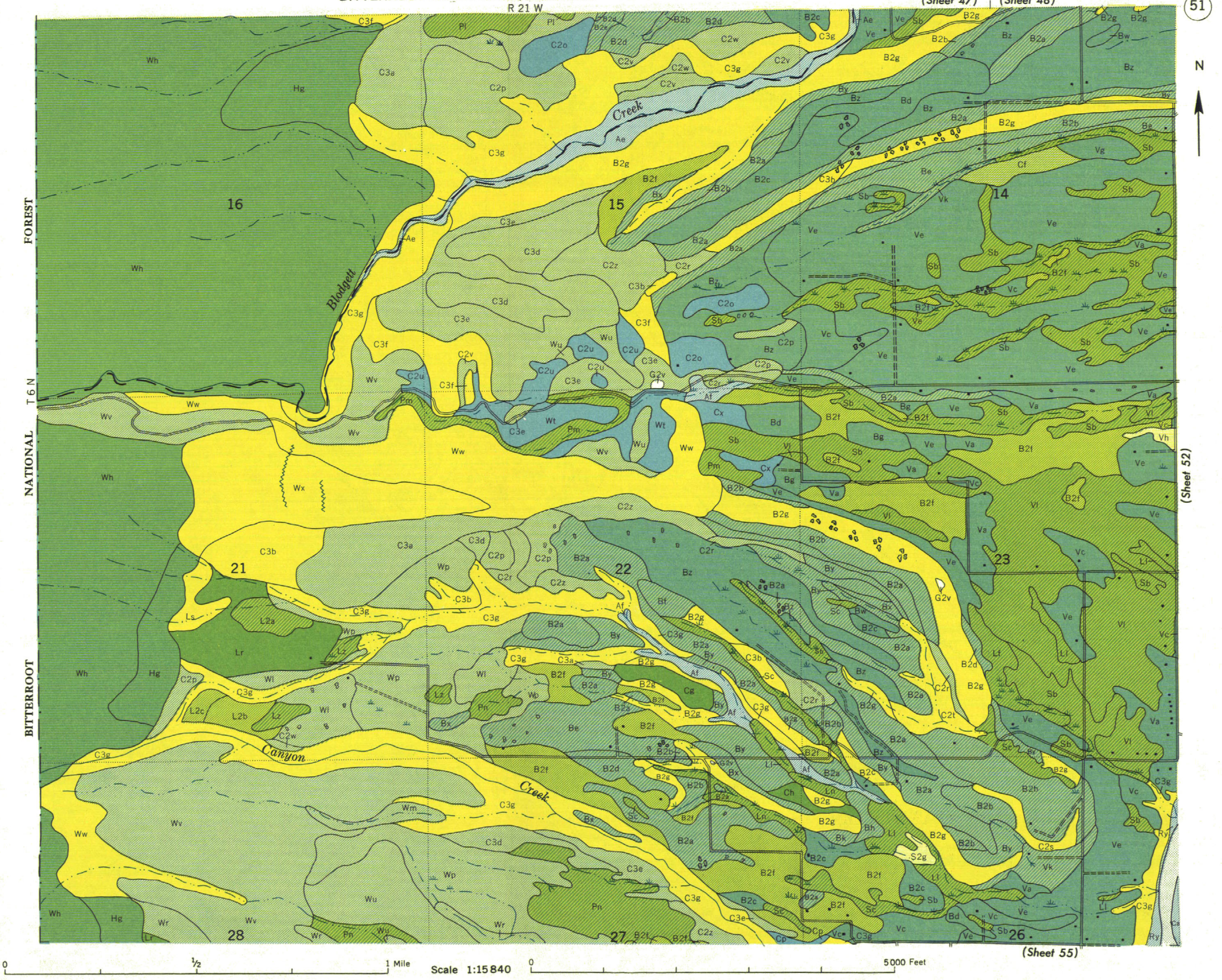

R 21 W
(Sheet 43)
T 7 N
T 6 N
N
BITTERROOT
NATIONAL
FOREST
Mill
Creek
(Sheet 48)
(Sheet 51)
32
33
34
35
4
3
2
9
10
11
0
1/2
Mile
Scale 1:15840
0
5000 Feet

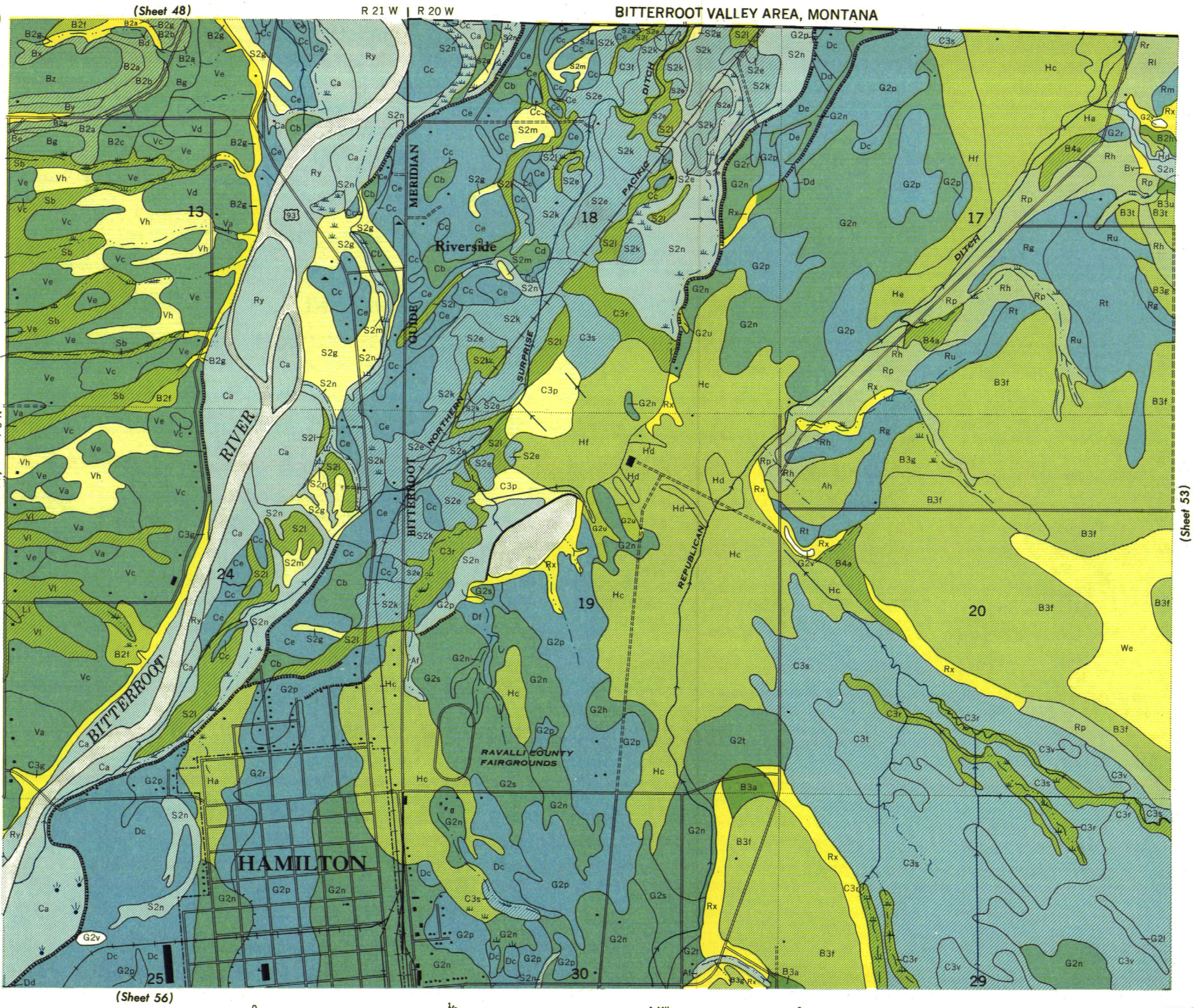

(Sheet 44)
R 21 W | R 20 W
N
T 7 N | T 6 N
(Sheet 47)
(Sheet 49)
(Sheet 51) | (Sheet 52)
35
36
31
32
2
1
6
5
11
12
7
8
Corvallis
Woodside
Willow Creek
Mill
Creek
Churn Creek
Blodgett Creek
BITTERROOT RIVER
BITTERROOT GUIDE MERIDIAN
SURPRISE DITCH
NORTHERN PACIFIC
93
Scale 1:15 840
0
½
1 Mile
0
5000 Feet


R 20 W
(Sheet 45)
N
Corvallis
T 7 N
T 6 N
DITCH
PACIFIC
NORTHERN
SURPRISE
REPUBLICAN
Chaf
Willow
Creek
Bitter
Creek
HEDGE
IRRIGATION
BITTERROOT
33
34
35
36
4
3
2
1
9
10
11
12
(Sheet 48)
(Sheet 50)
(Sheet 53)
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet



0 ½ 1 Mile Scale 1:15840 0 5000 Feet

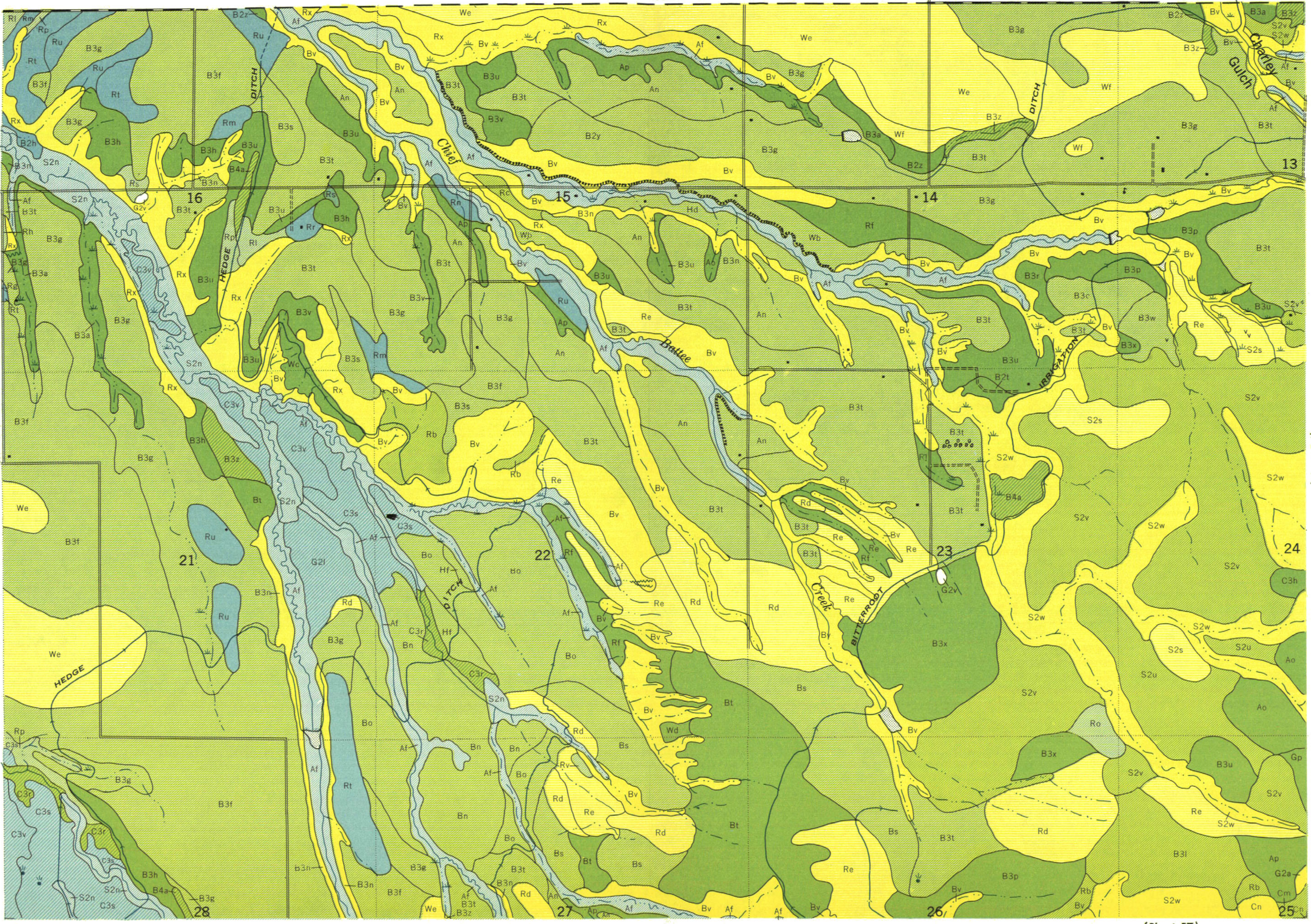

R 21 W
(Sheet 47)
(Sheet 48)
N
BITTERROOT NATIONAL FOREST
T 6 N
Blodgett
Creek
Canyon
Creek
16
15
14
21
22
23
28
27
26
(Sheet 52)
(Sheet 55)
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet



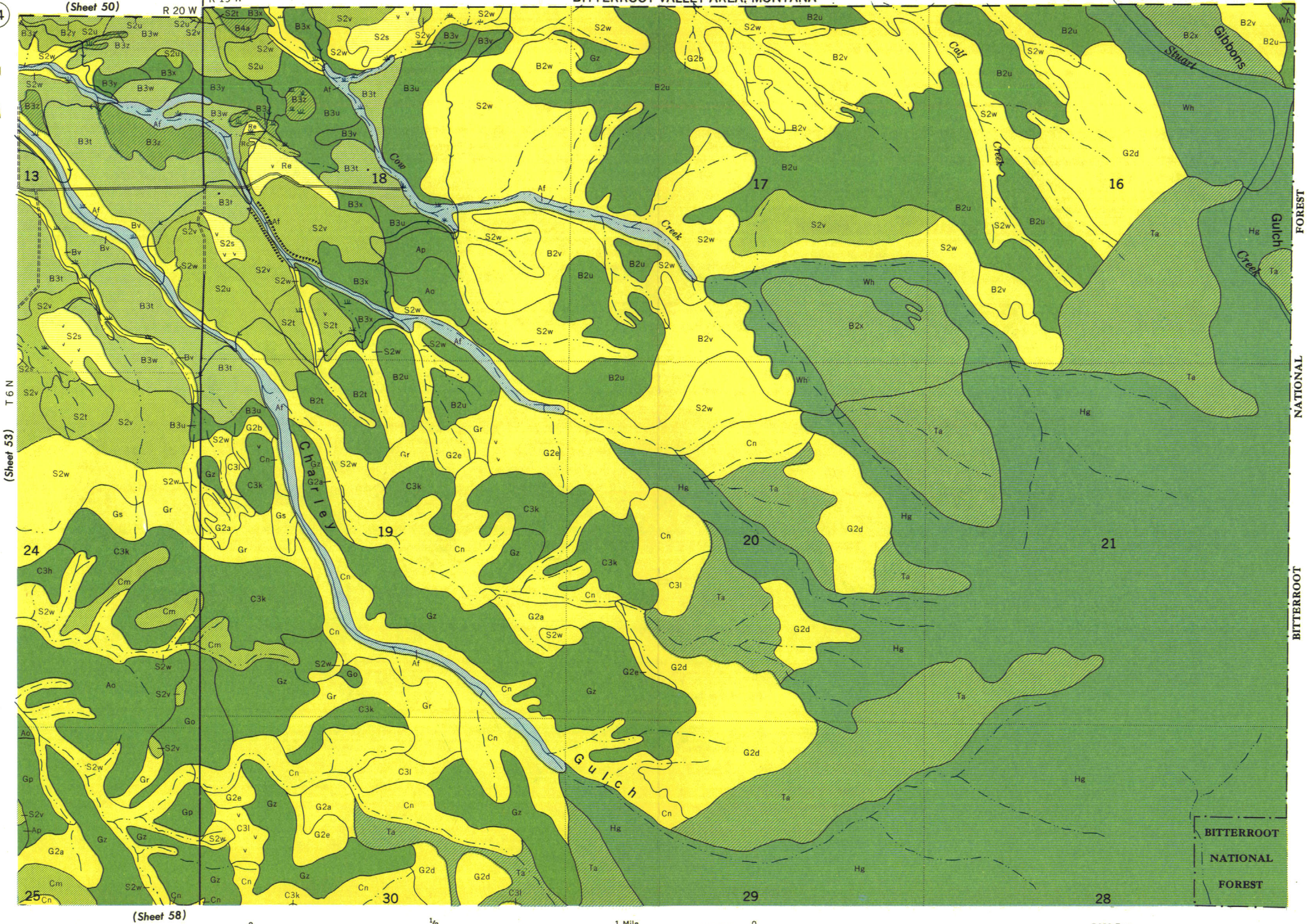
0 1/2 1 Mile

Scale 1:15 840

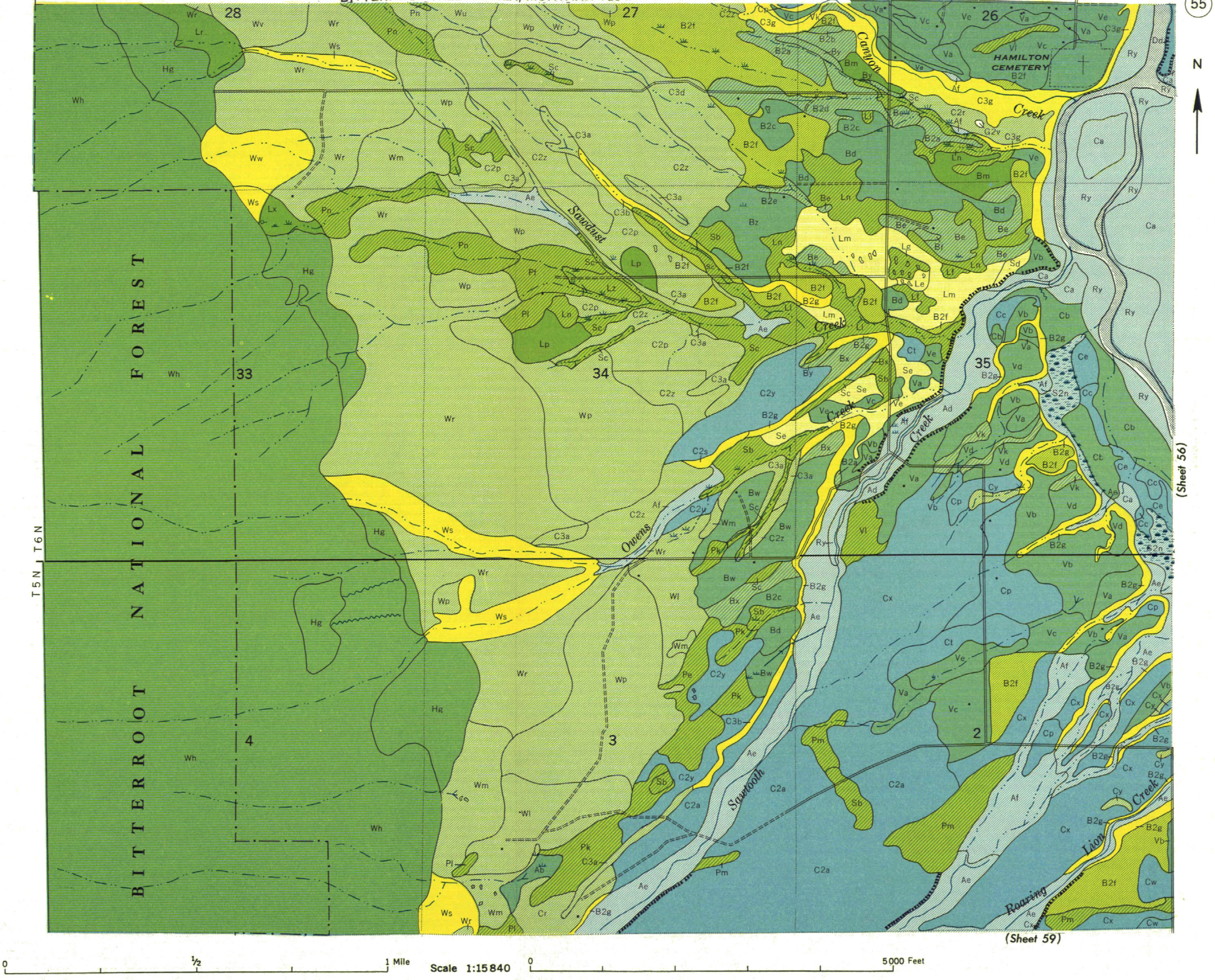
0 5000 Feet

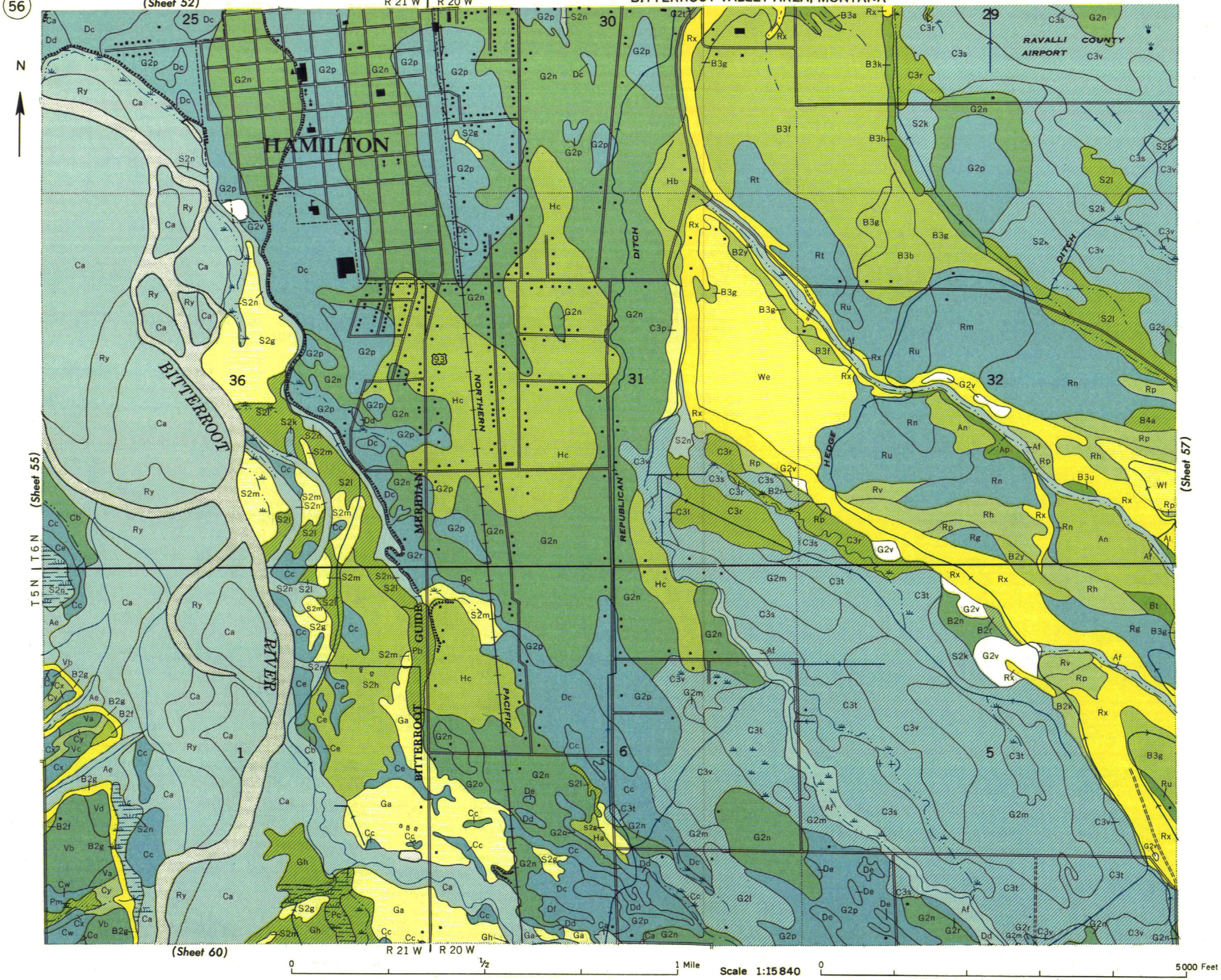


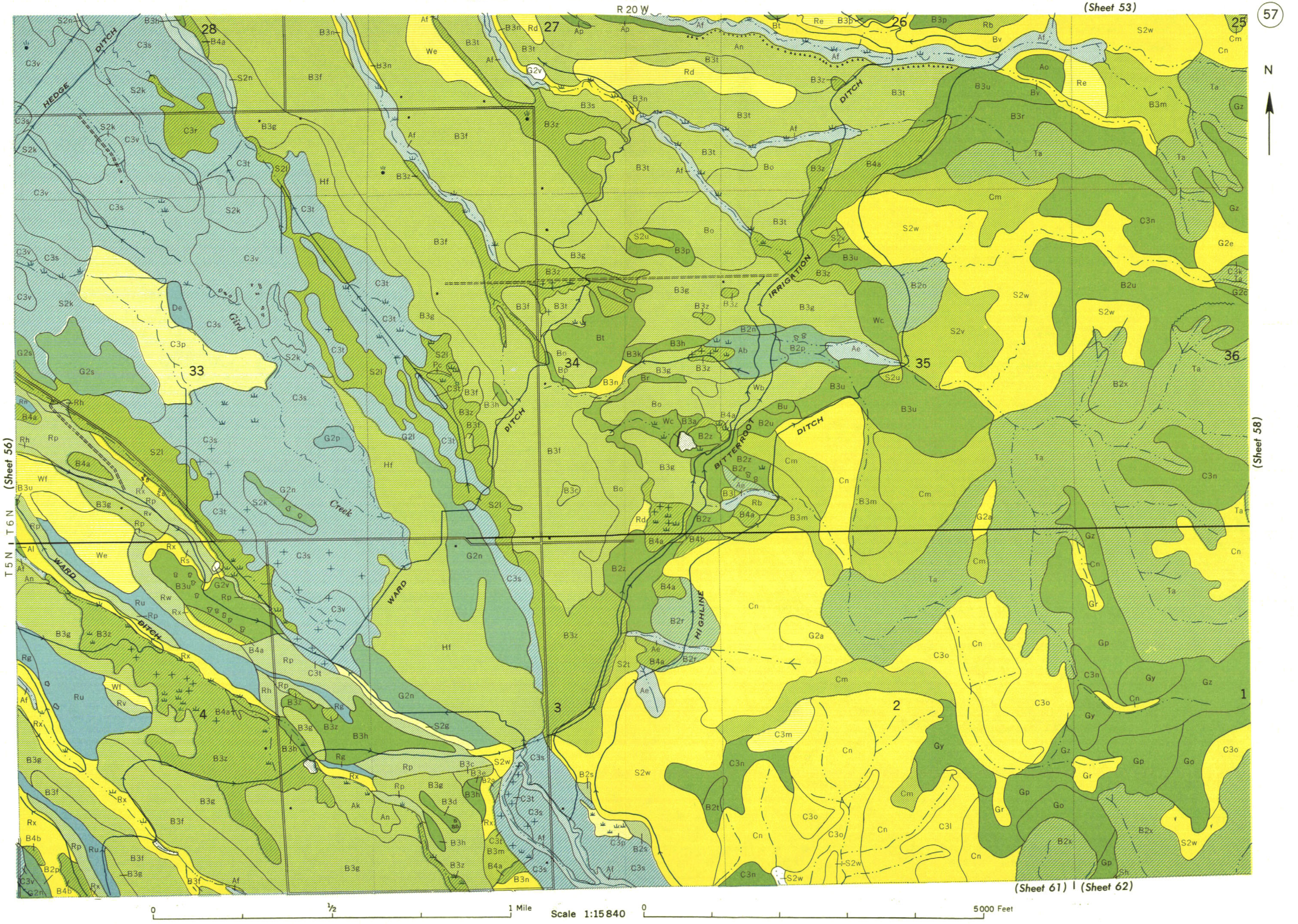
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

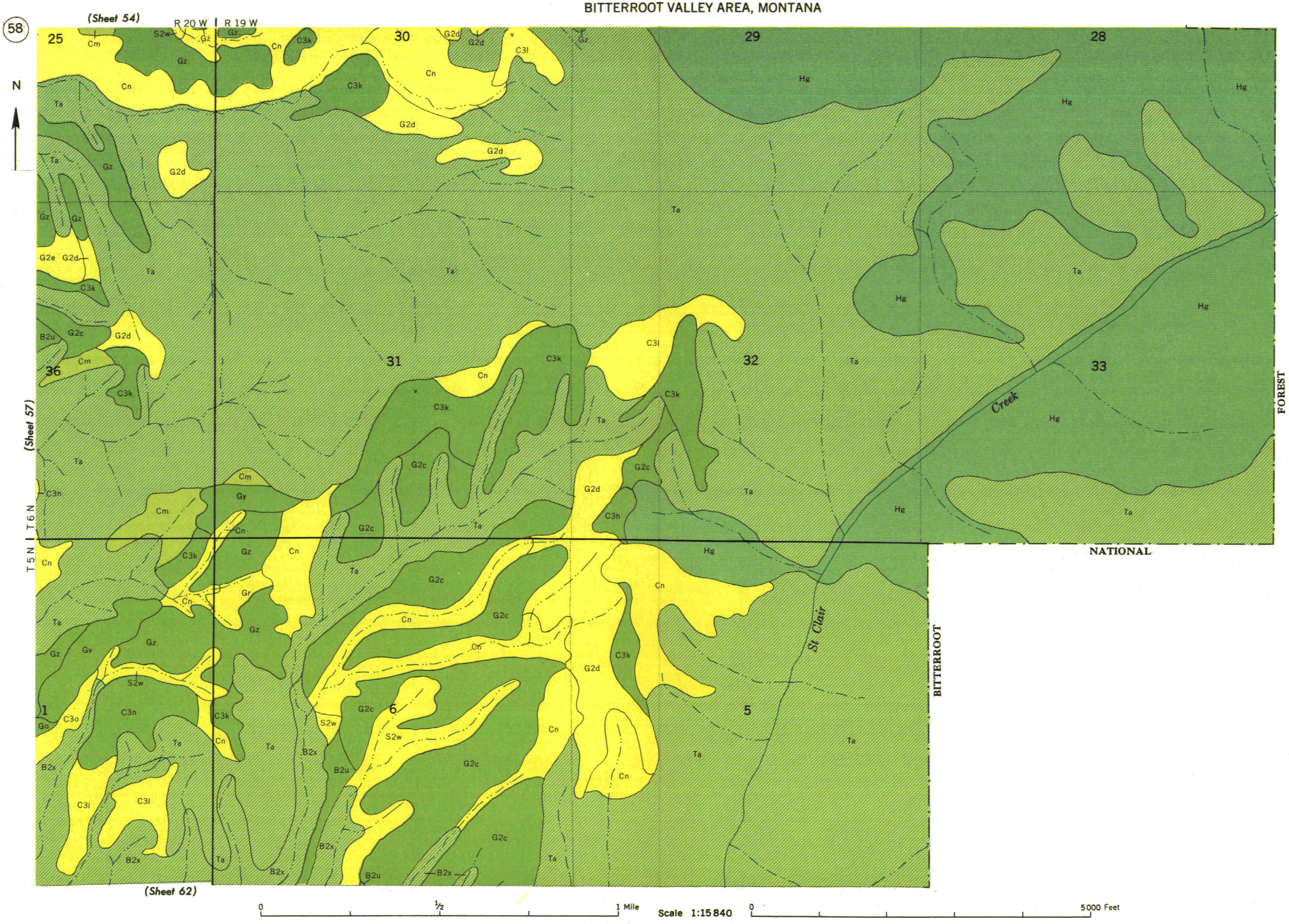


0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

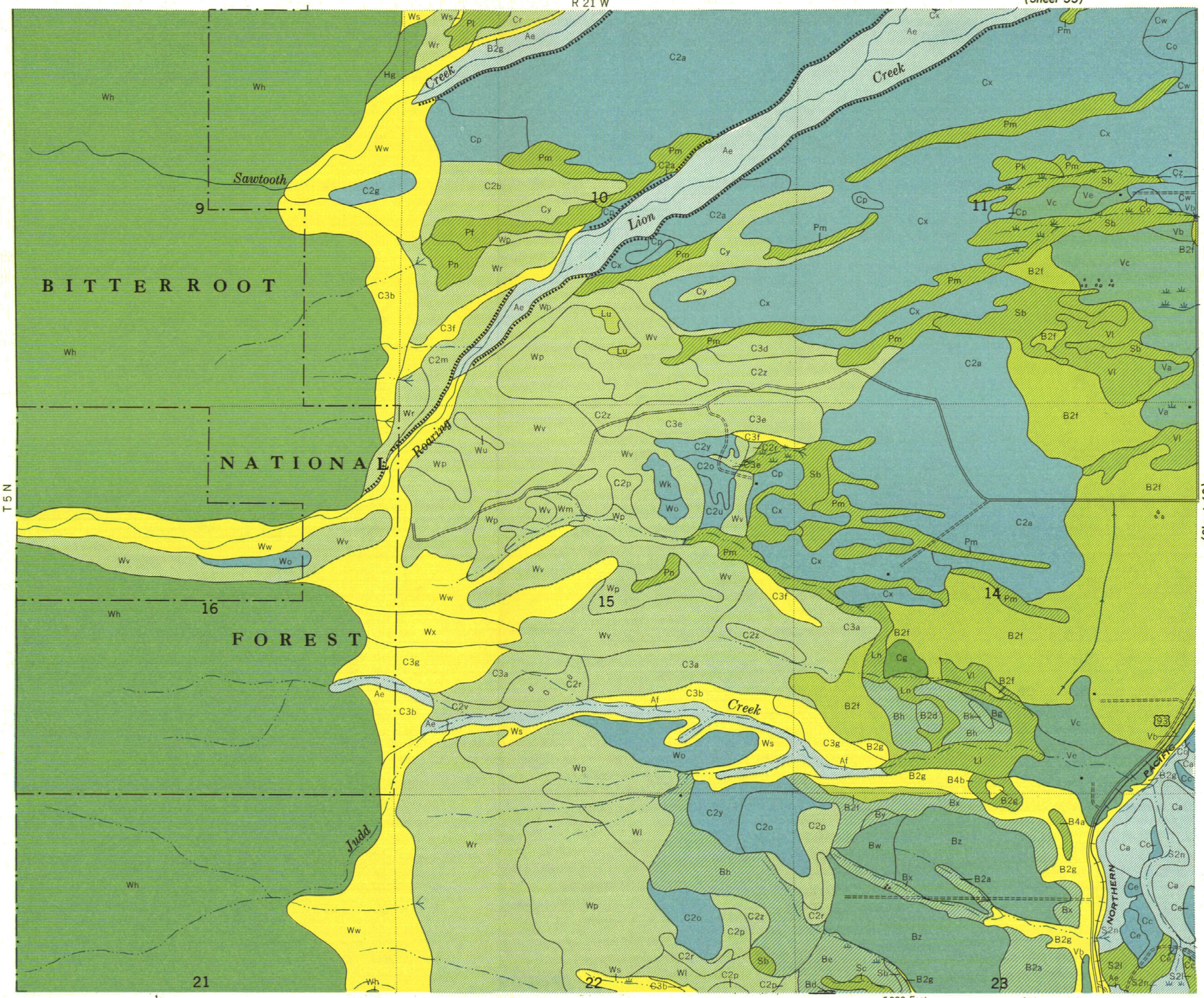

BITTERROOT NATIONAL FOREST
HAMILTON CEMETERY
Canyon Creek
Sawdust Creek
Owens Creek
Sawtooth Creek
Roaring Lion Creek
28
27
26
33
34
35
4
3
2
T 6 N
T 5 N
N
(Sheet 56)
(Sheet 59)
0 1/2 1 Mile
Scale 1:15 840
0 5000 Feet


(Sheet 52)
R 21 W | R 20 W
N
HAMILTON
BITTERROOT RIVER
RAVALLI COUNTY AIRPORT
NORTHERN PACIFIC
BITTERROOT
MERIDIAN GUIDE
REPUBLICAN DITCH
HEDGE
DITCH
25
30
29
36
31
32
1
6
5
(Sheet 55)
(Sheet 57)
(Sheet 60)
T 6 N | T 5 N
0
½
1 Mile
Scale 1:15 840
0
5000 Feet


R 20 W
(Sheet 53)
N
(Sheet 56)
(Sheet 58)
(Sheet 61)
(Sheet 62)
T 6 N
T 5 N
HEDGE DITCH
Gird Creek
WARD DITCH
IRRIGATION DITCH
BITTERROOT DITCH
HIGHLINE DITCH
28
27
26
25
33
34
35
36
4
3
2
1
0
½
1 Mile
Scale 1:15 840
0
5000 Feet


(Sheet 54)
R 20 W
R 19 W
N
(Sheet 57)
T 6 N
T 5 N
(Sheet 62)
25
30
29
28
36
31
32
33
1
6
5
St Clair
Creek
BITTERROOT
NATIONAL
FOREST
Cm
Cn
Gz
S2w
C3k
G2d
C3l
Hg
Ta
G2e
G2c
B2u
C3n
Gy
Gr
Gv
C3o
Go
B2x
C3h
0
½
1 Mile
Scale 1:15 840
5000 Feet

(Sheet 55)



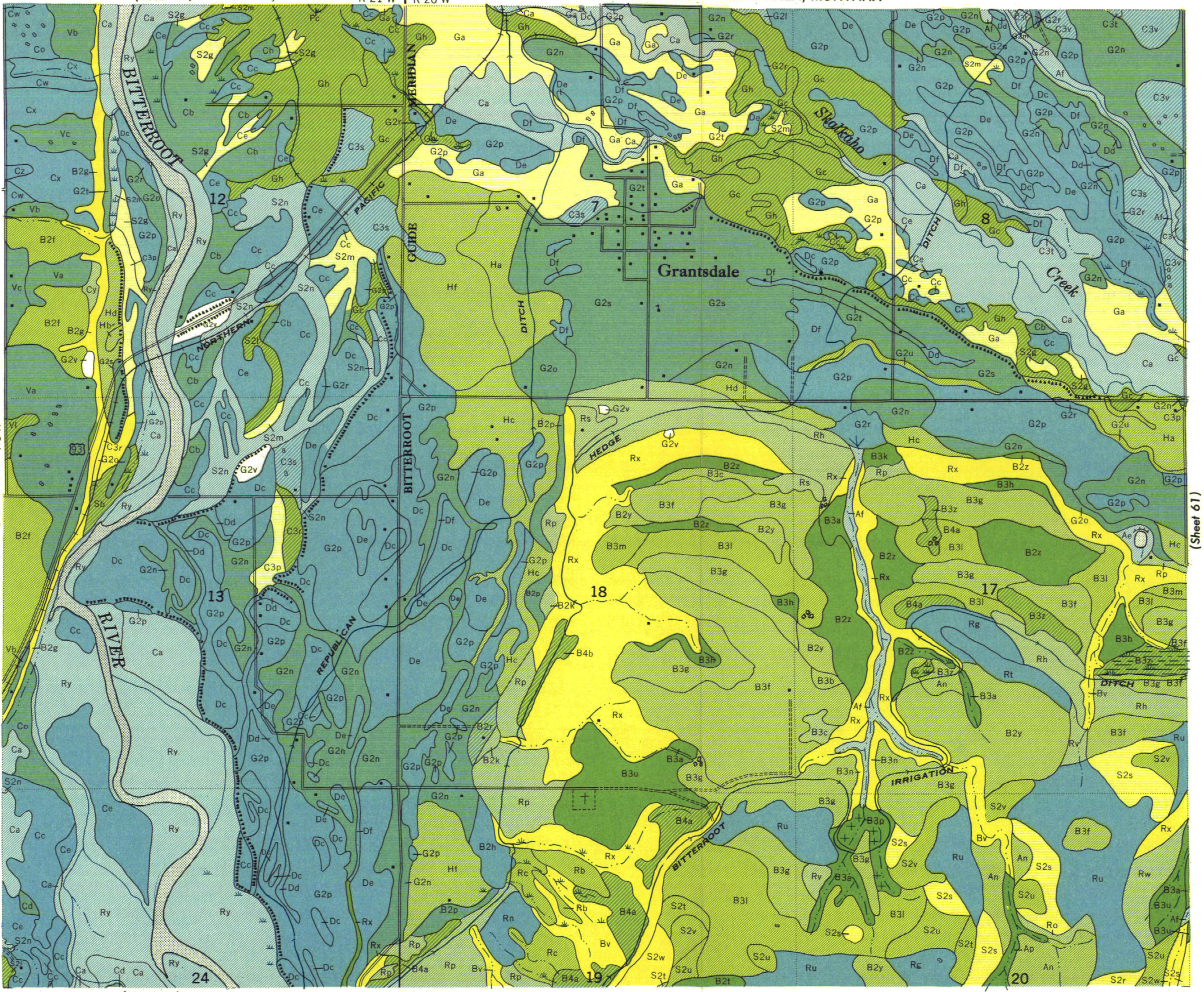
(Sheet 60)

(Sheet 63)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

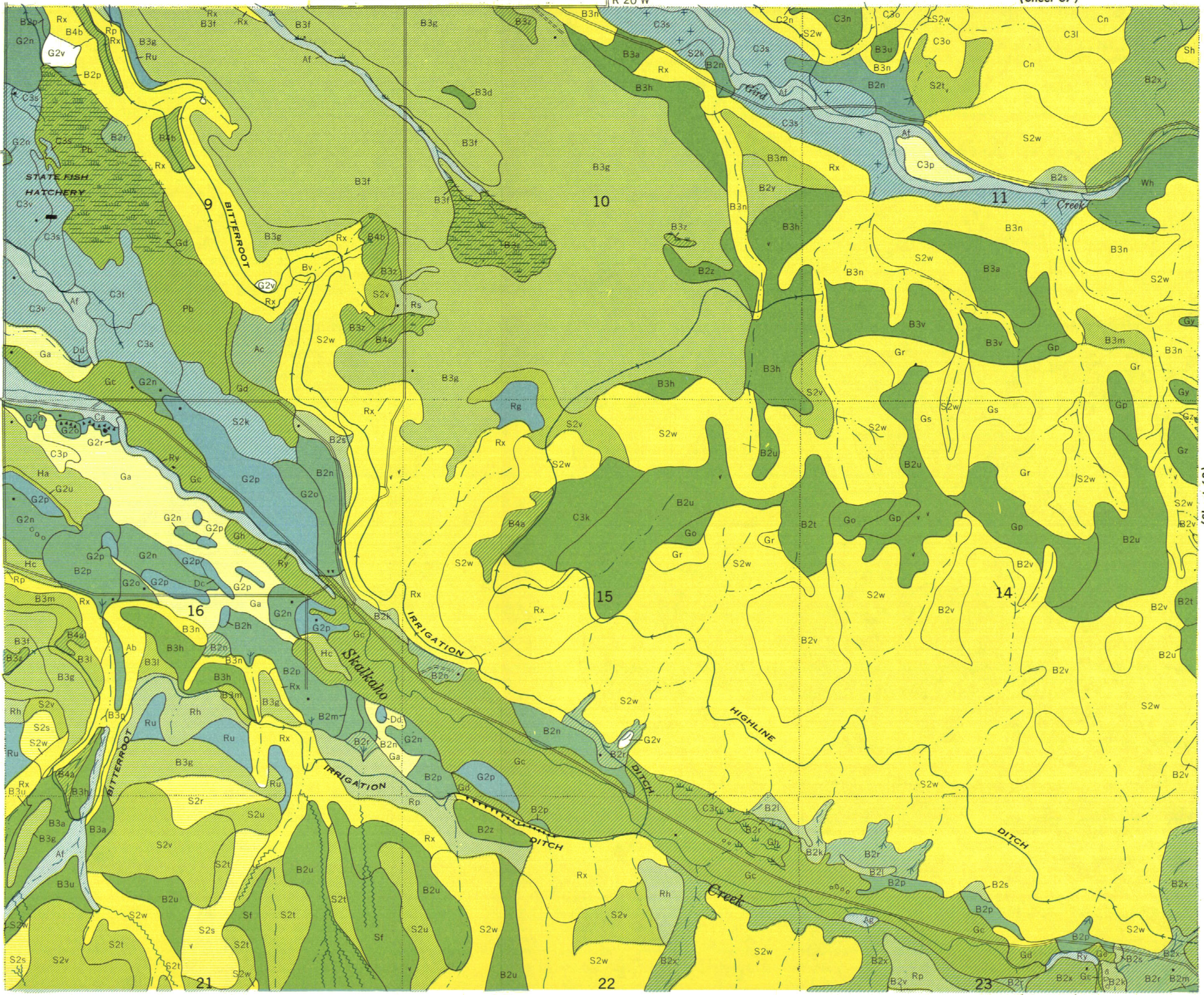


0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

R 20 W

(Sheet 57)

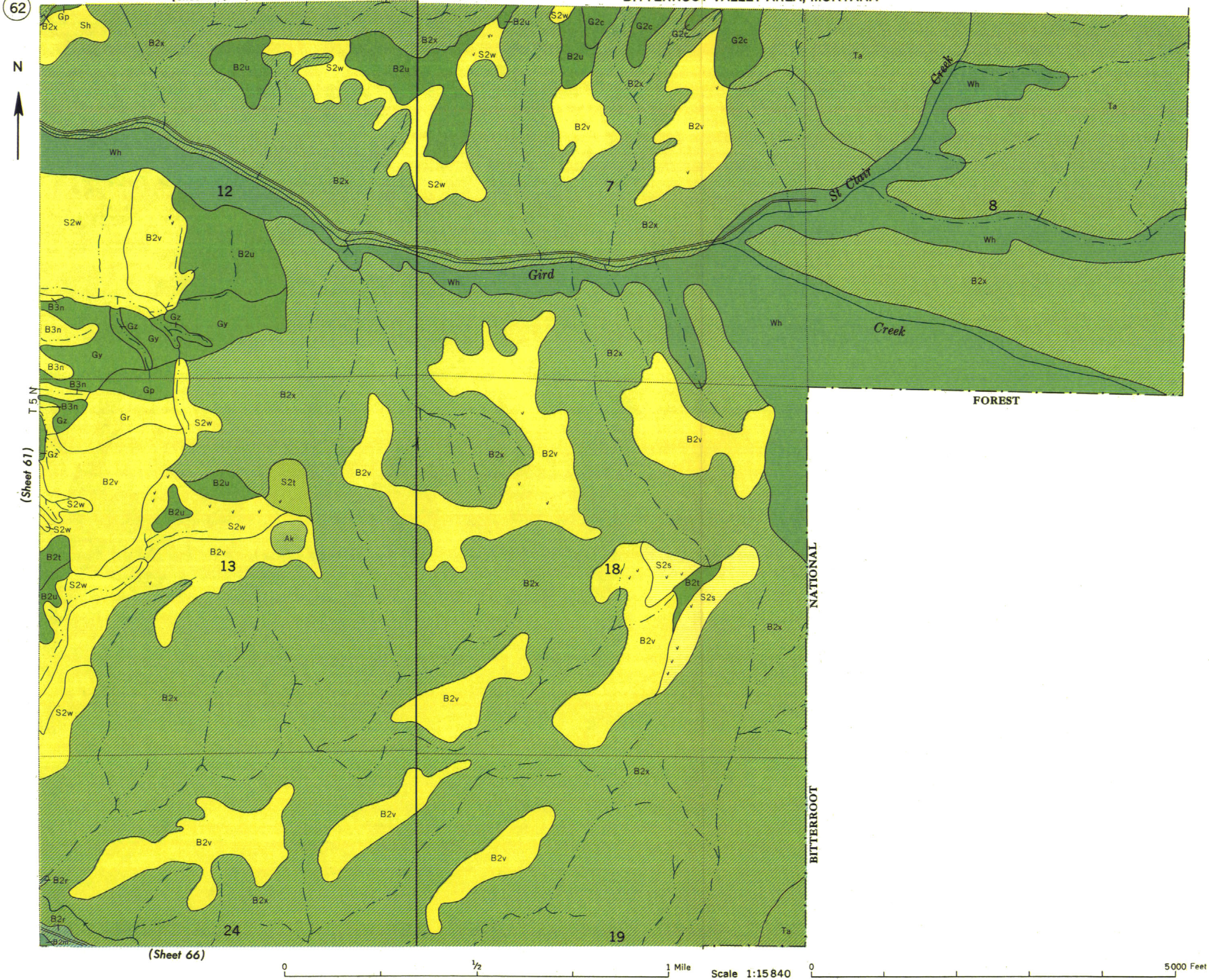
(Sheet 60) T 5 N



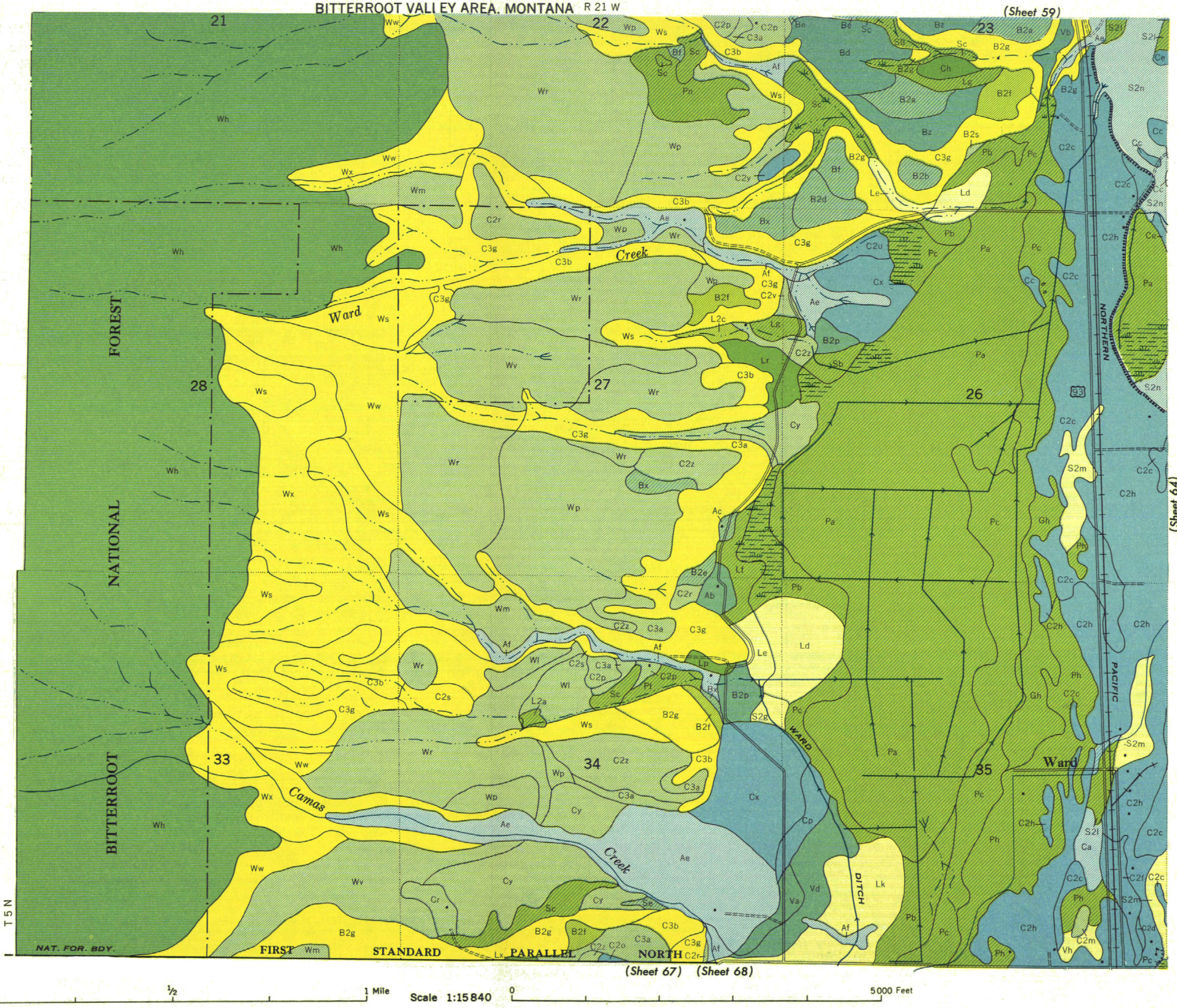
(Sheet 62)

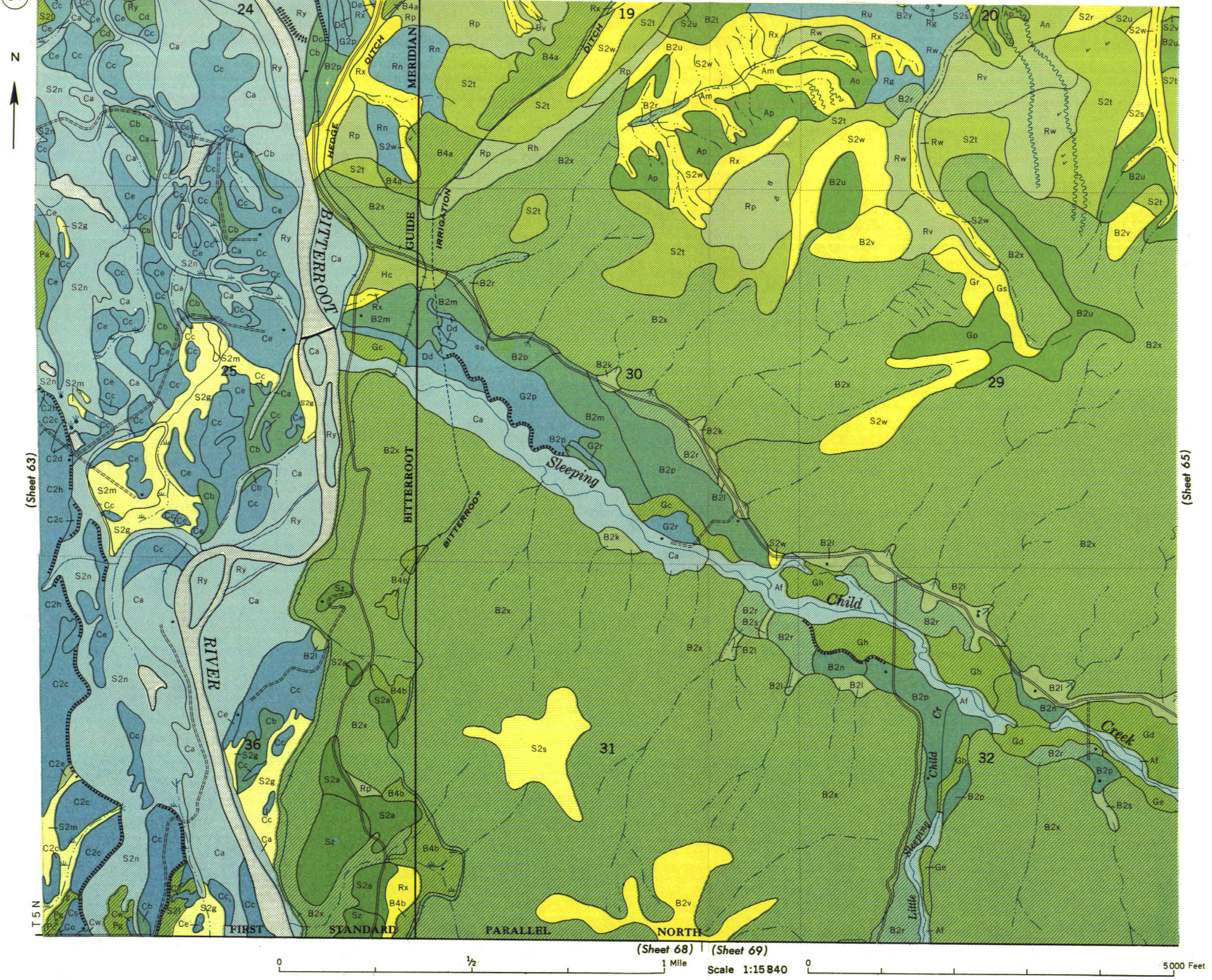
(Sheet 65)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

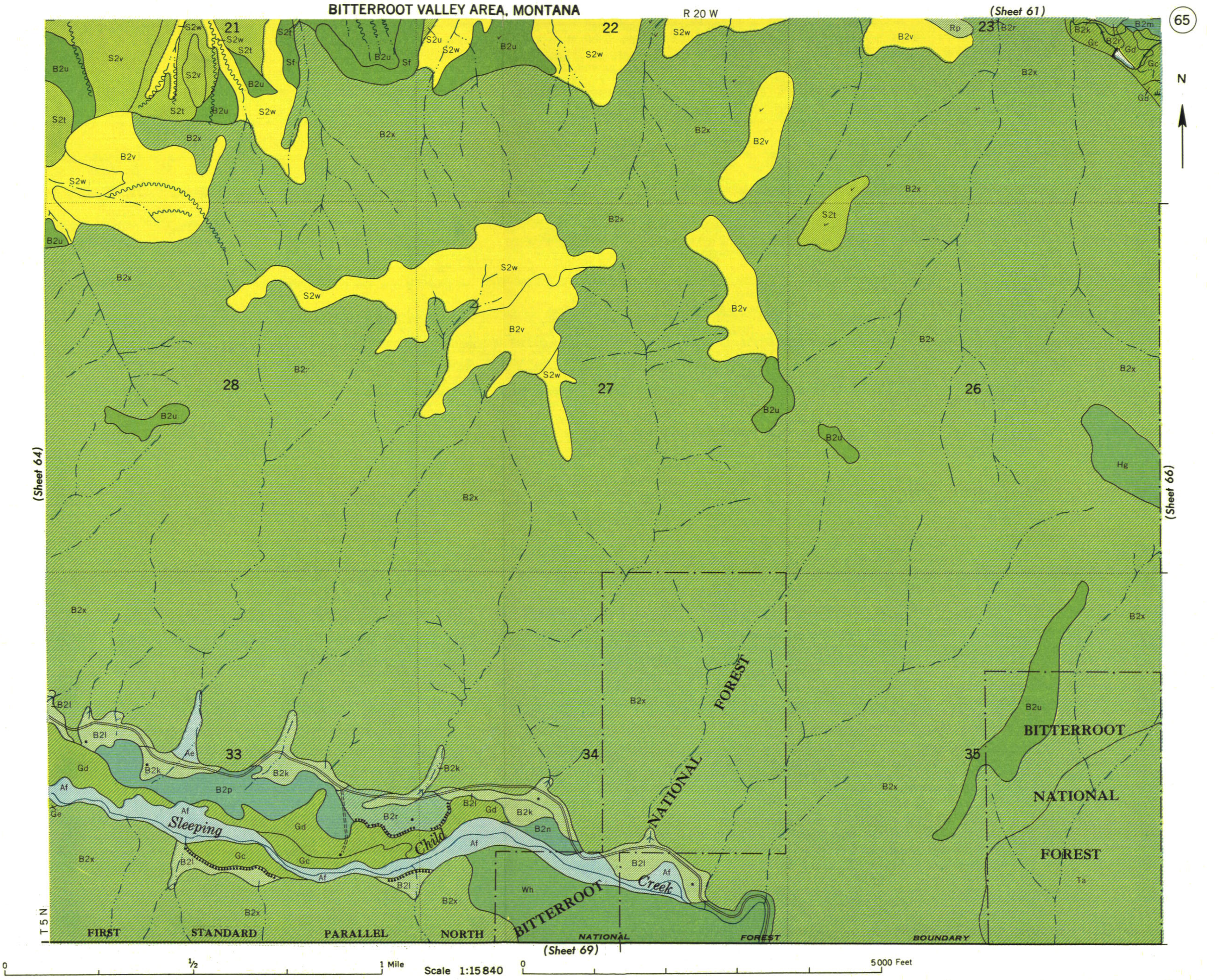


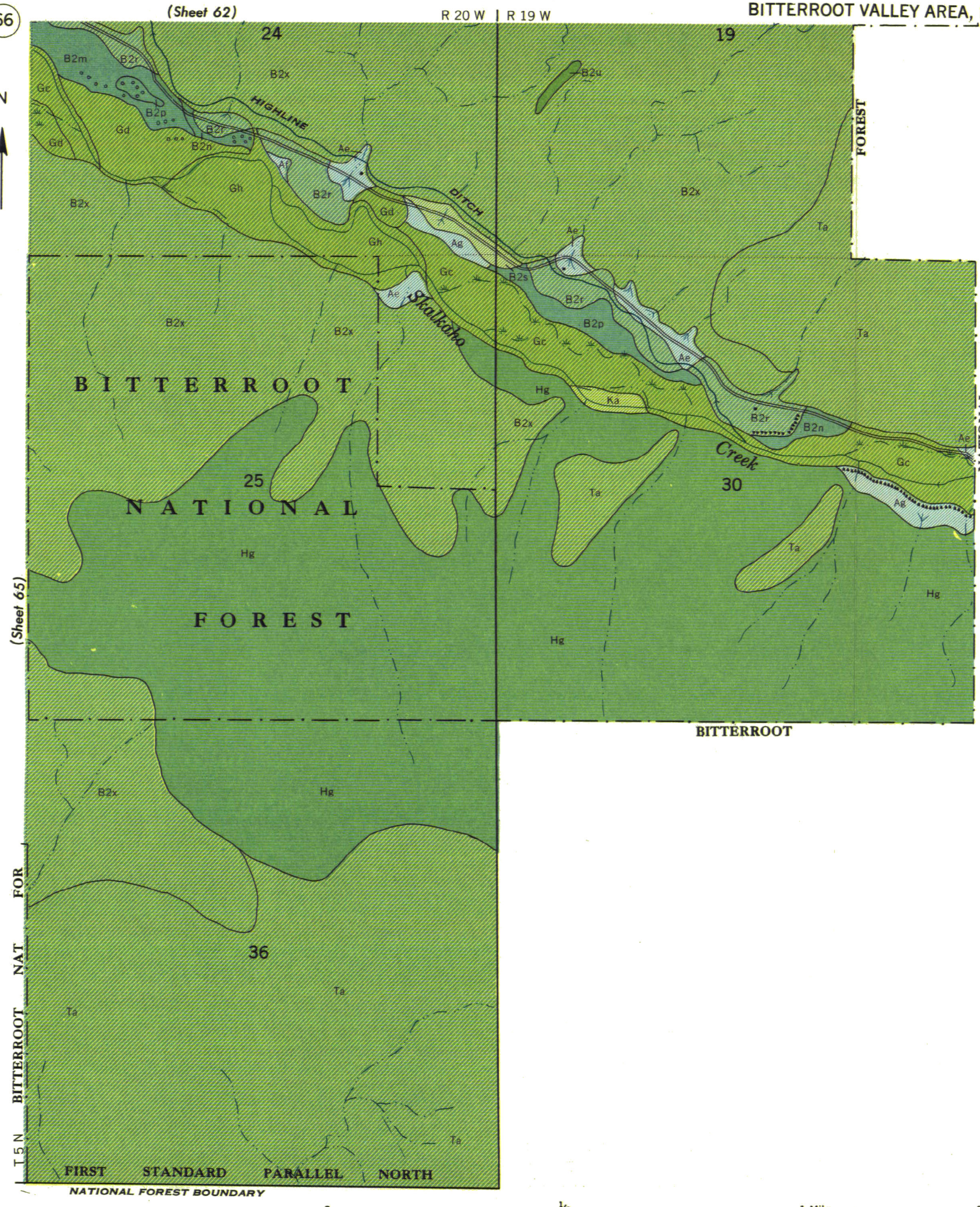
Scale 1:15 840


R 21 W
(Sheet 59)
N
21
22
23
26
27
28
33
34
35
BITTERROOT NATIONAL FOREST
Ward Creek
Camas Creek
WARD DITCH
NORTHERN PACIFIC
Ward
(Sheet 64)
T 5 N
NAT. FOR. BDY.
FIRST STANDARD PARALLEL NORTH
(Sheet 67)
(Sheet 68)
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet



(Sheet 60)
R 21 W
R 20 W
N
24
19
20
25
30
29
36
31
32
(Sheet 63)
(Sheet 65)
MERIDIAN
GUIDE
BITTERROOT
HEDGE
DITCH
IRRIGATION
BITTERROOT
RIVER
Sleeping
Child
Creek
Little
Sleeping
Child Cr.
T 5 N
FIRST STANDARD PARALLEL NORTH
(Sheet 68)
(Sheet 69)
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

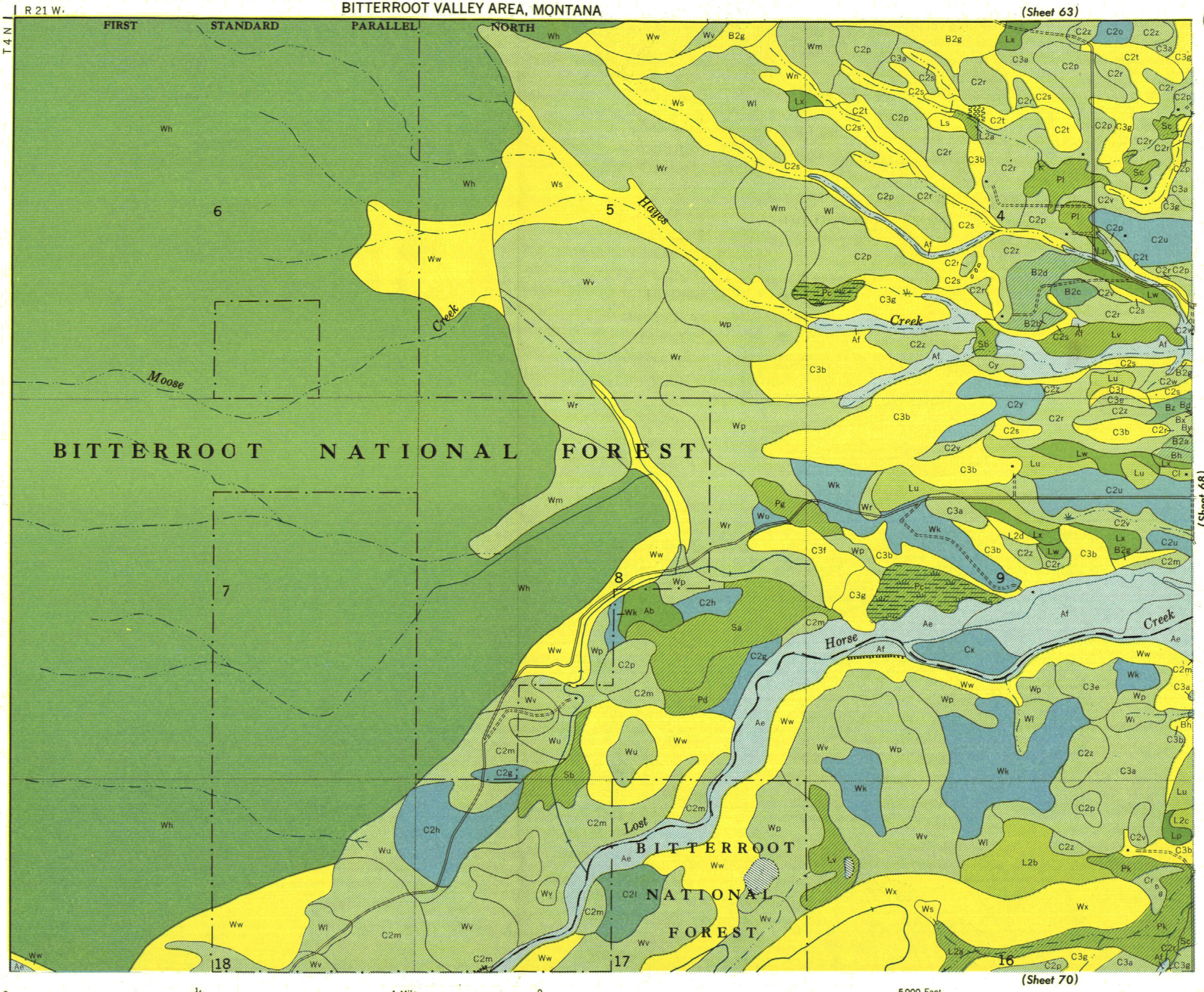

R 20 W
(Sheet 61)
(Sheet 64)
(Sheet 66)
(Sheet 69)
N
T 5 N
21
22
23
26
27
28
33
34
35
BITTERROOT NATIONAL FOREST
FIRST STANDARD PARALLEL NORTH
BITTERROOT NATIONAL FOREST BOUNDARY
Sleeping Child Creek
0 ½ 1 Mile
Scale 1:15 840
0 5000 Feet



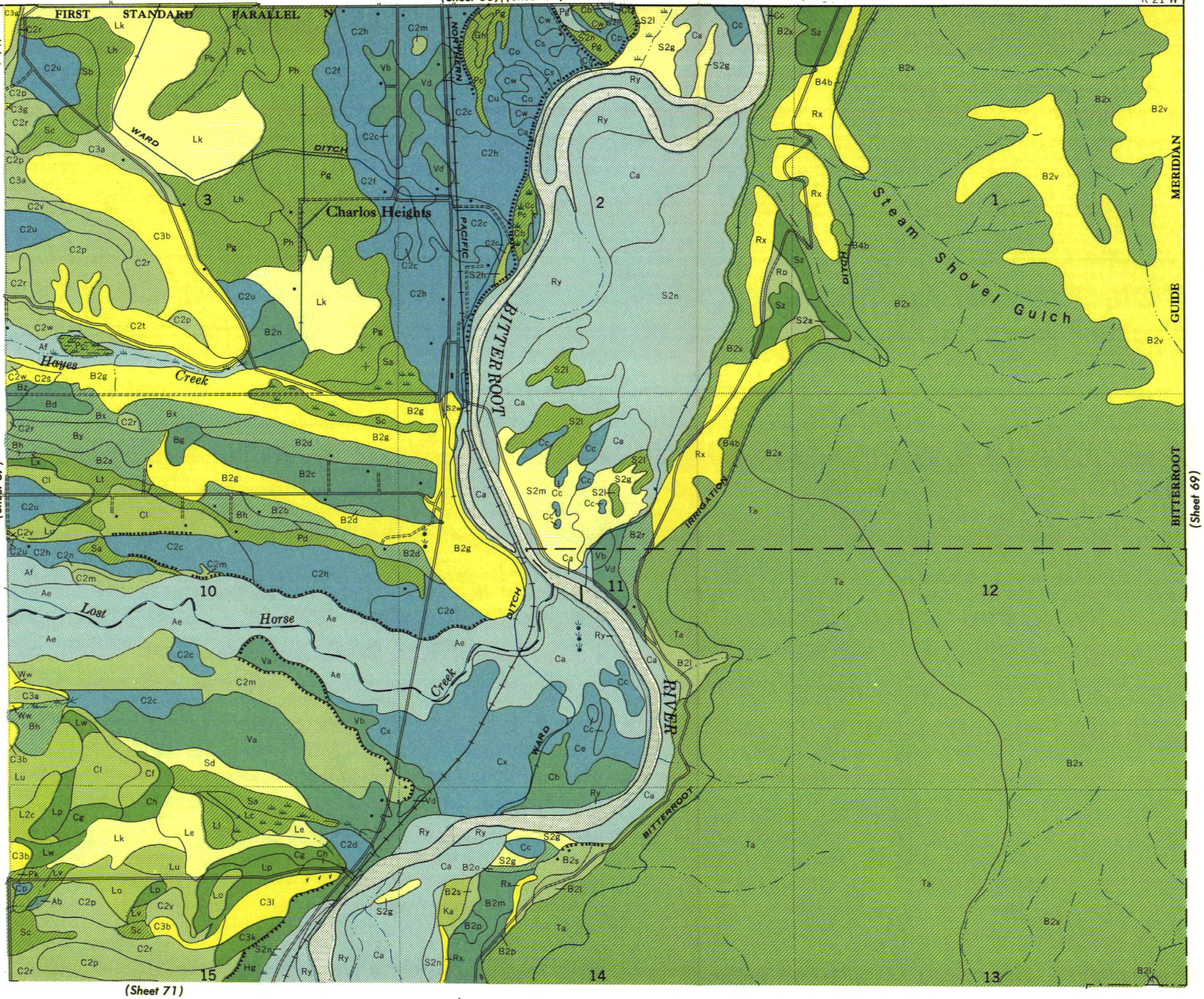
0 ½ 1 Mile

Scale 1:15 840

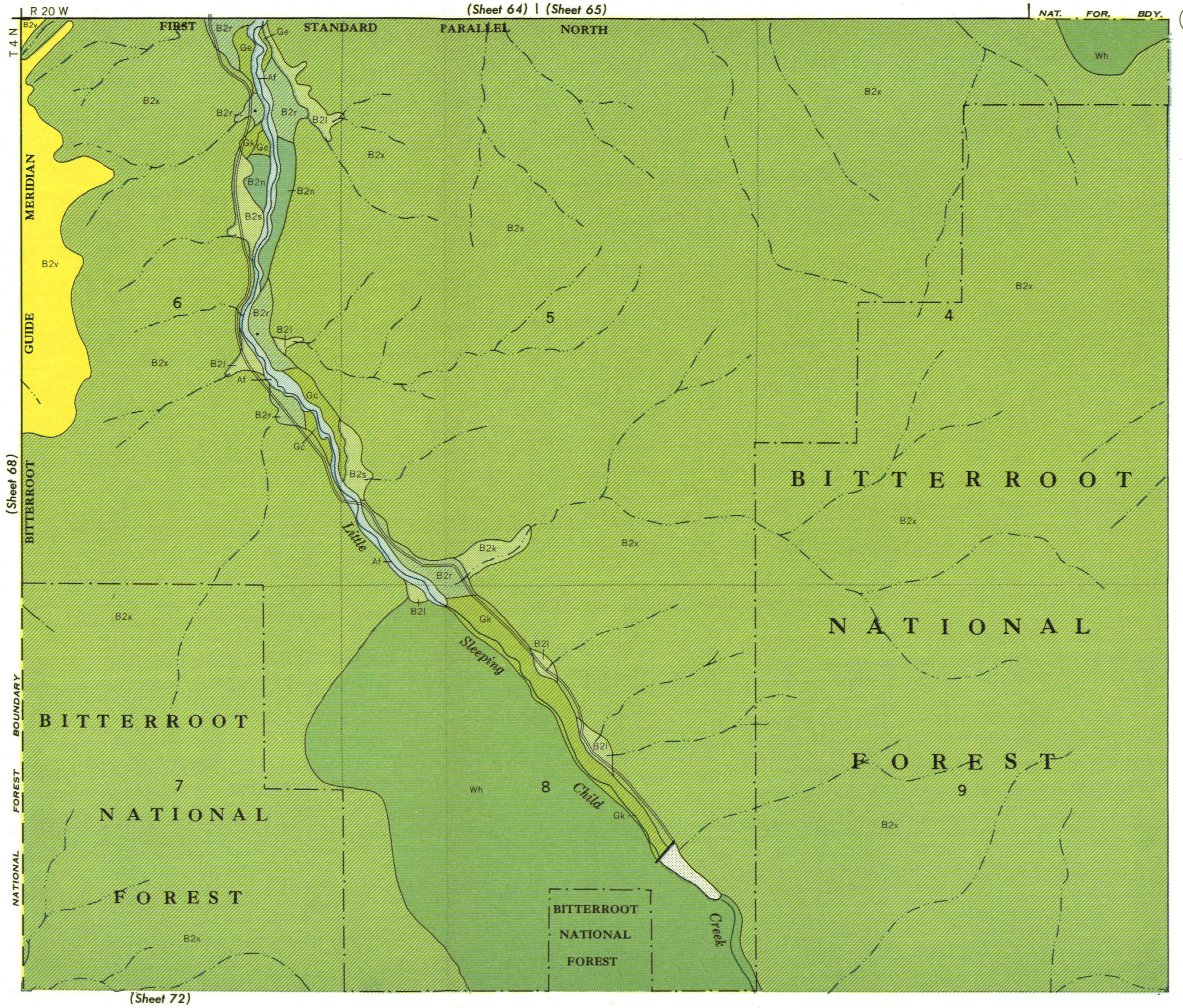
0 5000 Feet



0 ½ 1 Mile Scale 1:15 840 0 5000 Feet



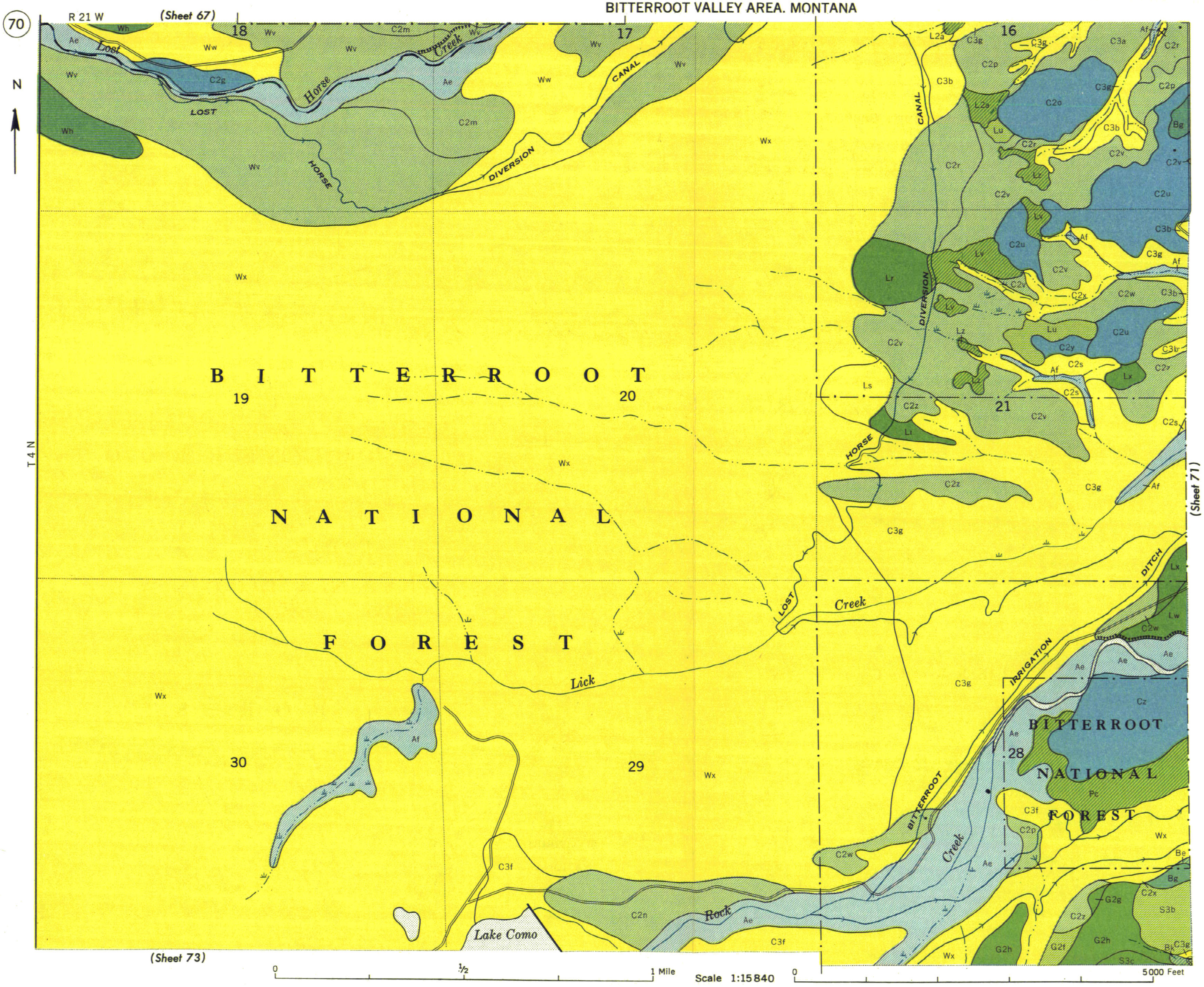
0 ½ 1 Mile Scale 1:15840 0 5000 Feet

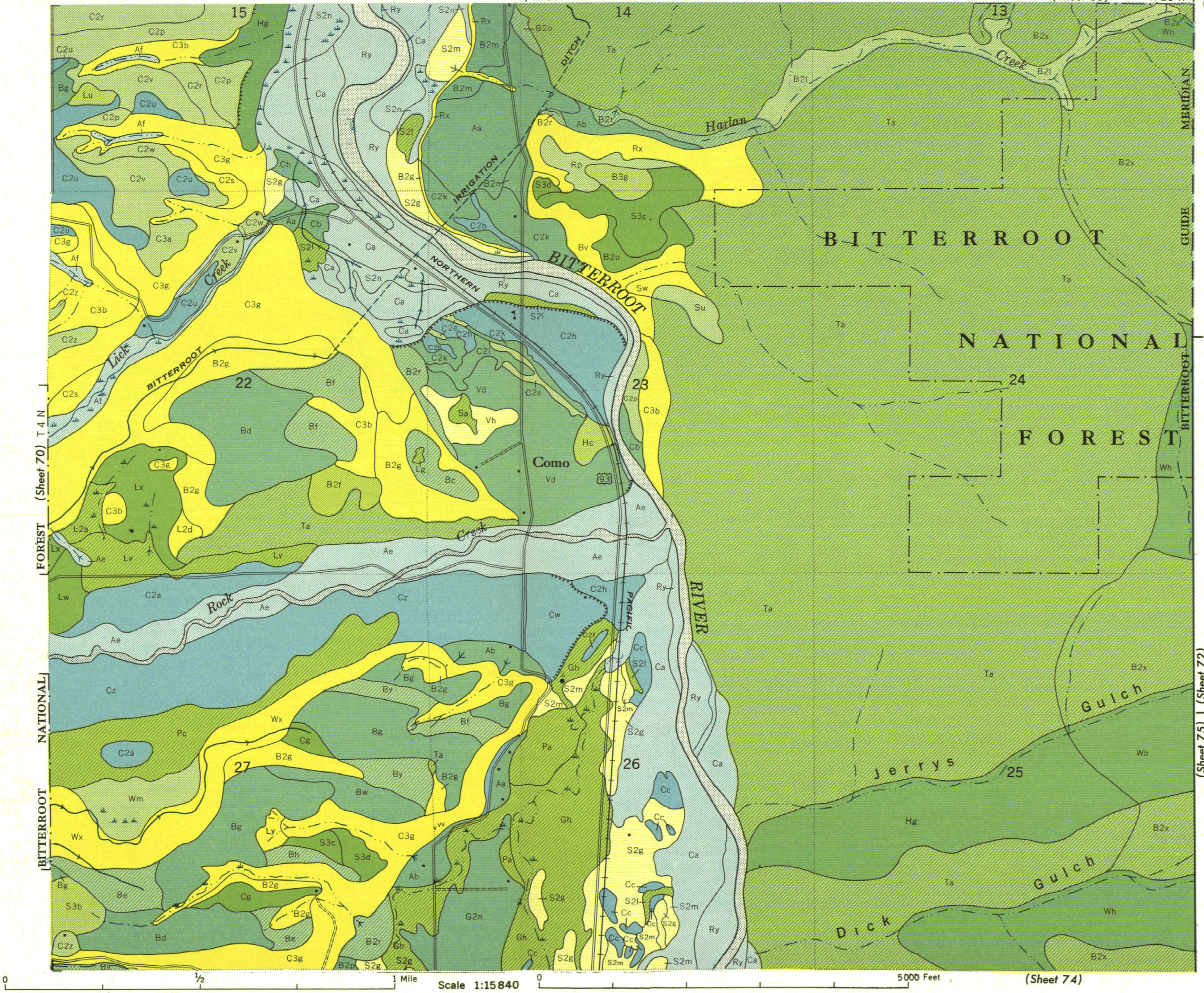


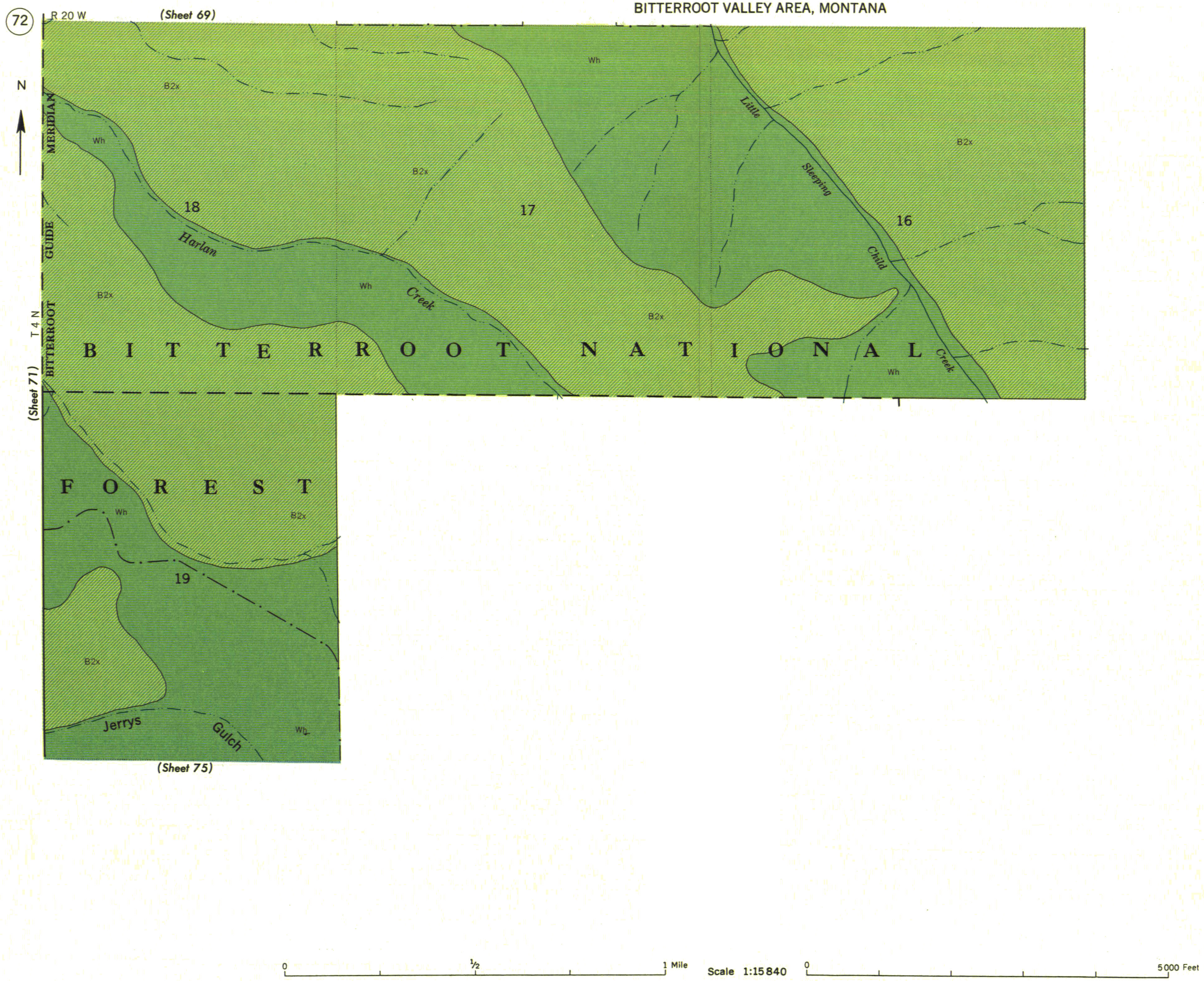
Scale 1:15840

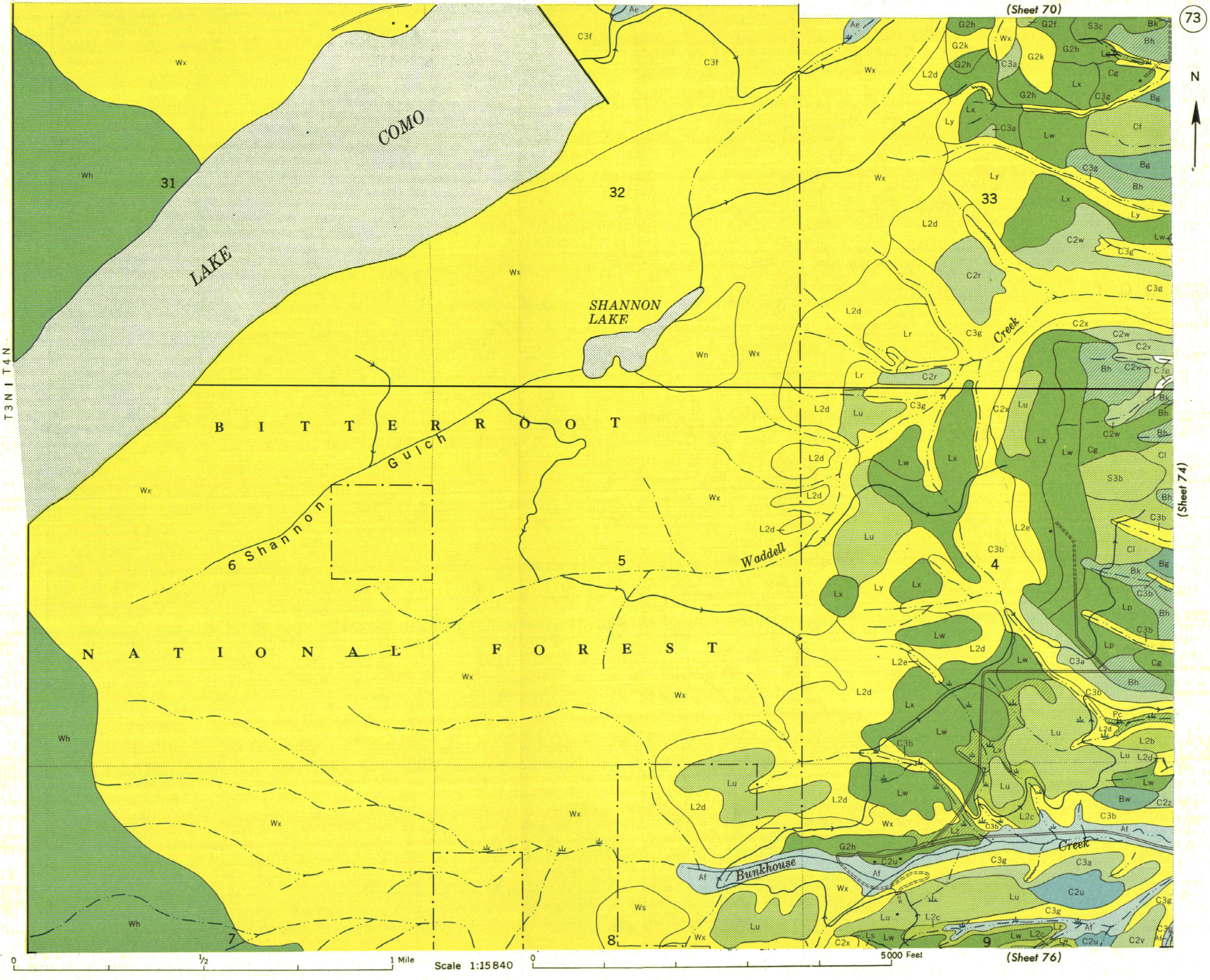
0 ½ 1 Mile

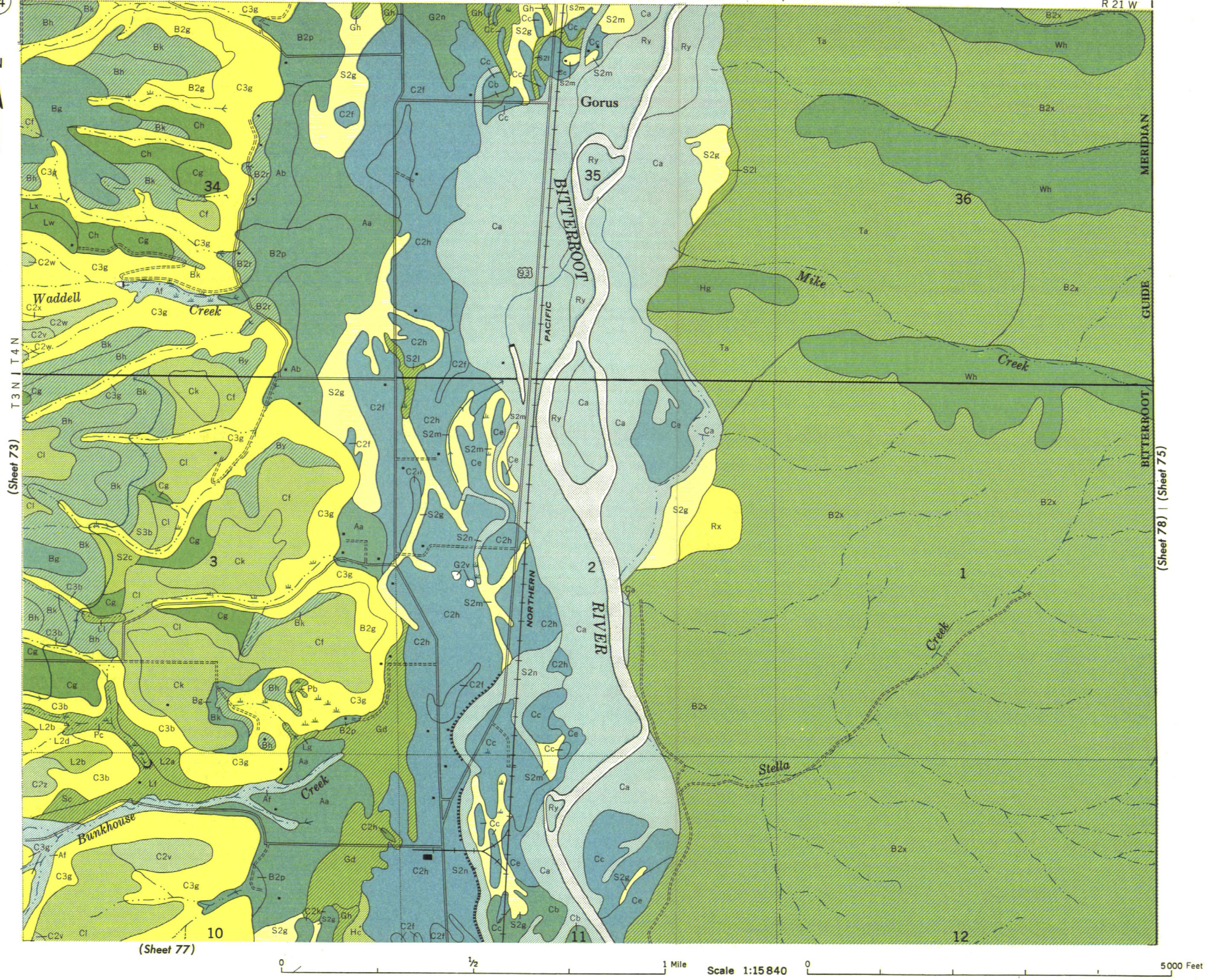
0 5000 Feet

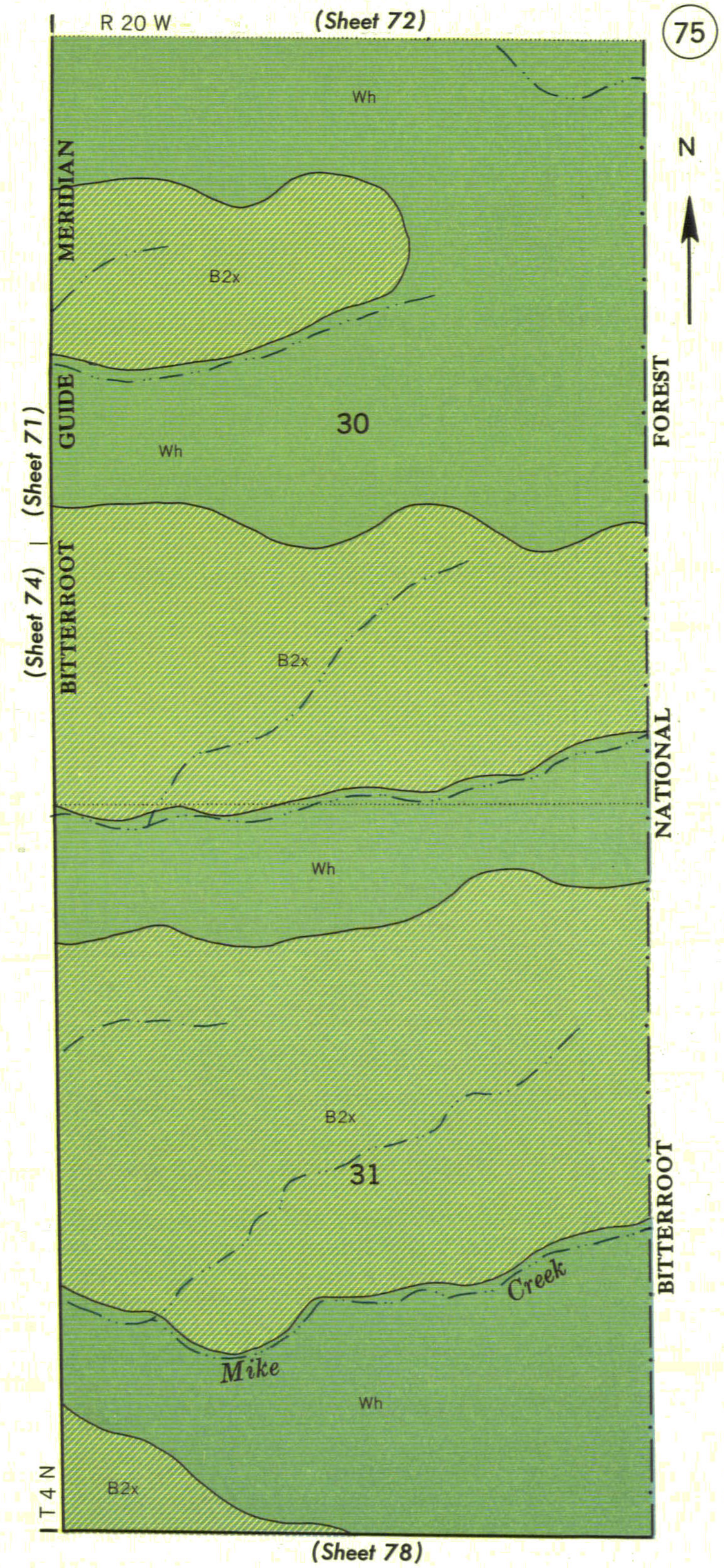

R 21 W
(Sheet 67)
N
T 4 N
(Sheet 71)
(Sheet 73)
18
17
16
19
20
21
30
29
28
BITTERROOT
NATIONAL
FOREST
Lost
Horse
Creek
LOST
HORSE
DIVERSION
CANAL
Lick
LOST
Creek
IRRIGATION
DITCH
BITTERROOT
Creek
Rock
Lake Como
Wh
Ae
Ww
Wv
C2m
C2g
Wx
Af
C3f
C2n
C3g
C2z
Lr
Ls
Lx
C2v
C2u
C2o
C3b
C3a
C2r
C2p
Lu
Lv
L2a
Lw
C2w
Cz
Pe
Be
Bg
G2g
G2h
G2f
S3b
S3c
C2s
C2x
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet


(Sheet 68)
R 21 W
N
BITTERROOT NATIONAL FOREST
BITTERROOT NATIONAL FOREST
GUIDE MERIDIAN
BITTERROOT
(Sheet 70)
T 4 N
(Sheet 72)
(Sheet 75)
BITTERROOT RIVER
NORTHERN PACIFIC
IRRIGATION DITCH
Harlan Creek
Lick Creek
Rock Creek
Jerrys Gulch
Dick Gulch
Como
93
13
14
15
22
23
24
25
26
27
Scale 1:15840
0
½
1 Mile
0
5000 Feet
(Sheet 74)


R 20 W
(Sheet 69)
N
BITTERROOT GUIDE MERIDIAN
T 4 N
(Sheet 71)
B2x
Wh
18
17
16
19
Harlan Creek
Little Sleeping Child Creek
BITTERROOT NATIONAL FOREST
Jerrys Gulch
(Sheet 75)
0
½
1 Mile
Scale 1:15 840
0
5 000 Feet


R 21 W
T 3 N | T 4 N
(Sheet 70)
(Sheet 74)
(Sheet 76)
N
COMO
LAKE
SHANNON LAKE
BITTERROOT
NATIONAL FOREST
6 Shannon Gulch
Waddell
Creek
Bunkhouse
Creek
31
32
33
5
4
7
8
9
0
1/2
1 Mile
Scale 1:15 840
0
5000 Feet

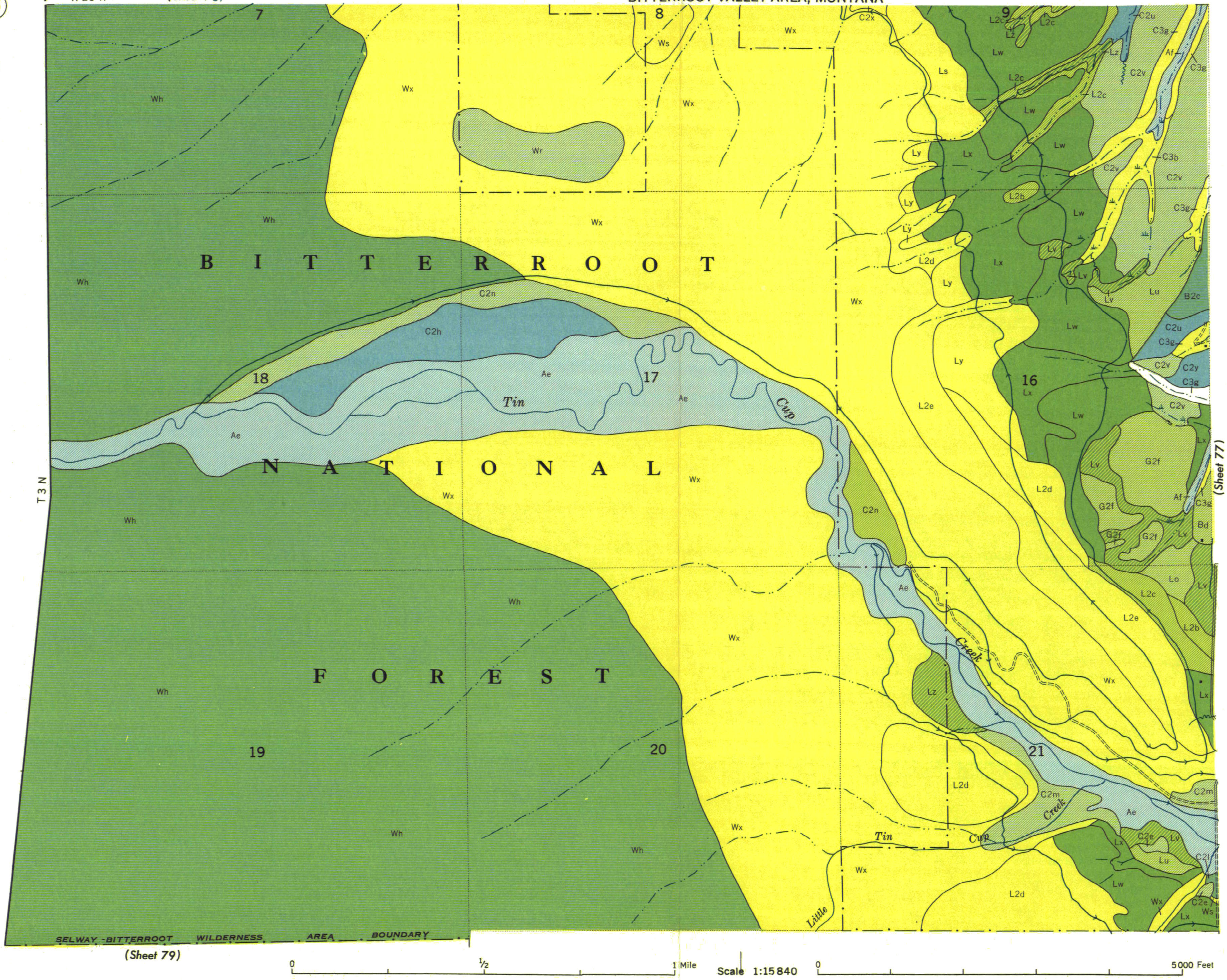

(Sheet 71)
(Sheet 73)
(Sheet 77)
(Sheet 78) | (Sheet 75)
R 21 W
N
T 4 N
T 3 N
Gorus
BITTERROOT
RIVER
NORTHERN
PACIFIC
93
Waddell
Creek
Mike
Creek
Bunkhouse
Creek
Stella
Creek
BITTERROOT
GUIDE
MERIDIAN
34
35
36
3
2
1
10
11
12
Scale 1:15840
0
1/2
1 Mile
0
5000 Feet



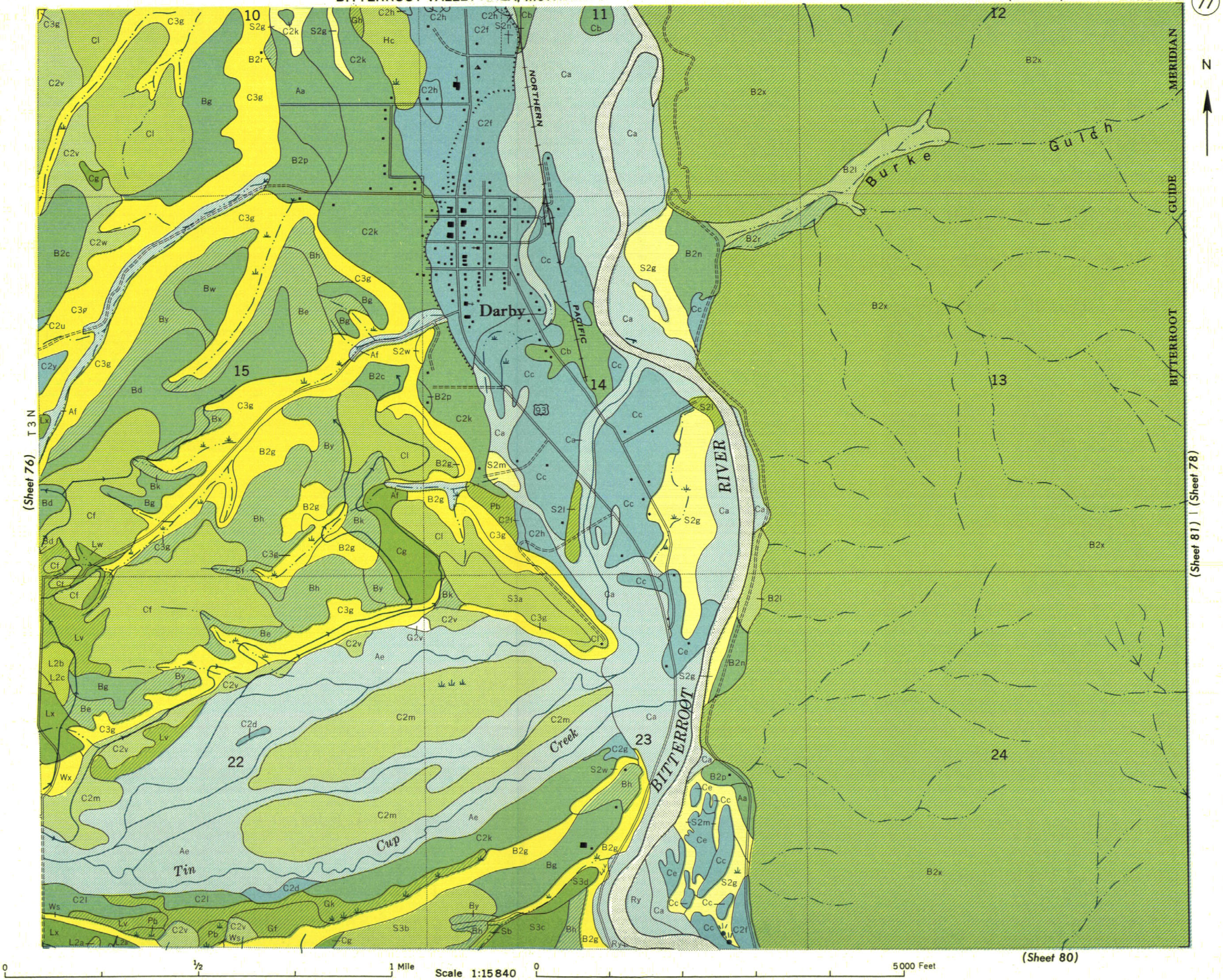
Scale 1:15 840

0 ½ 1 Mile

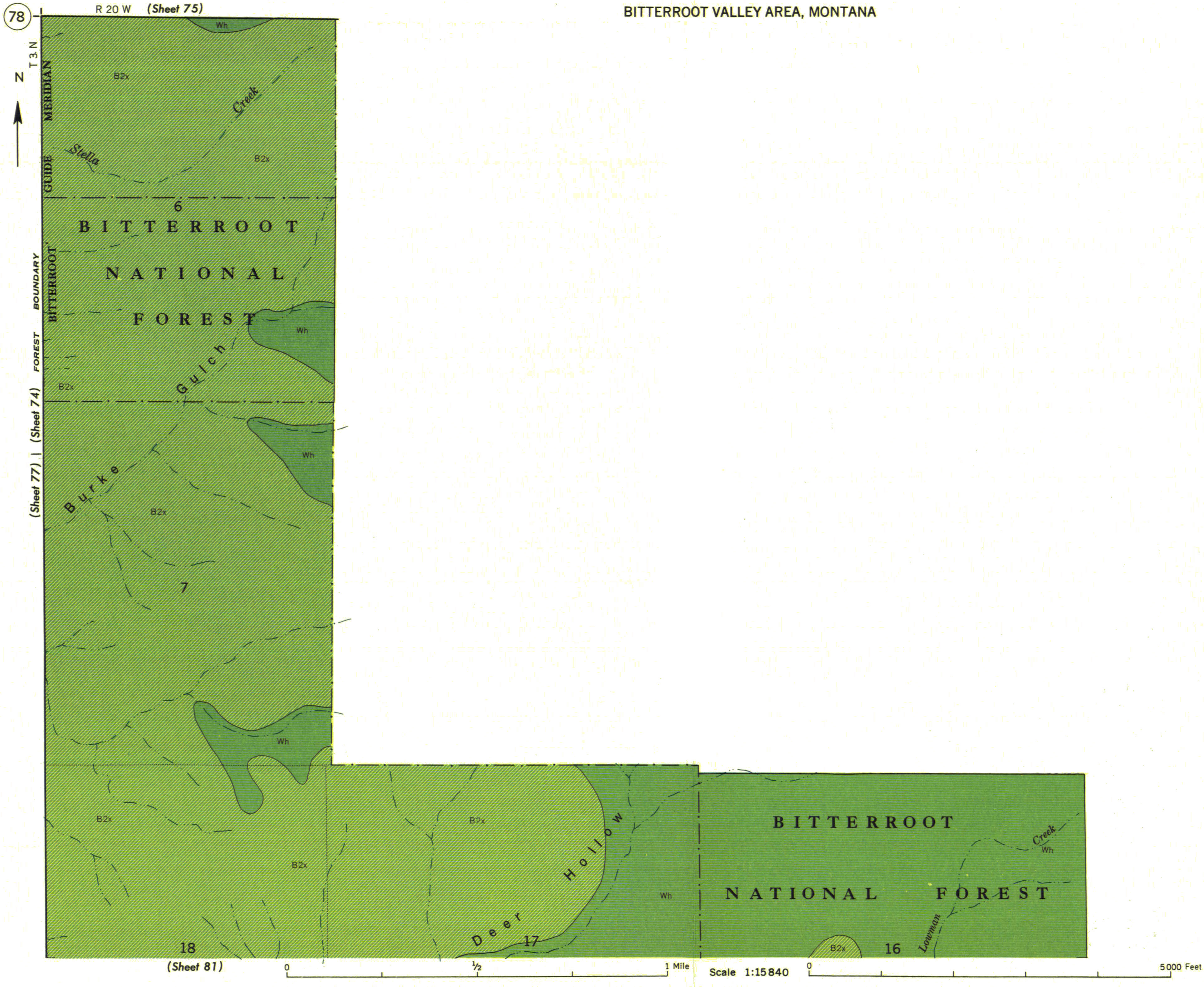
0 5000 Feet

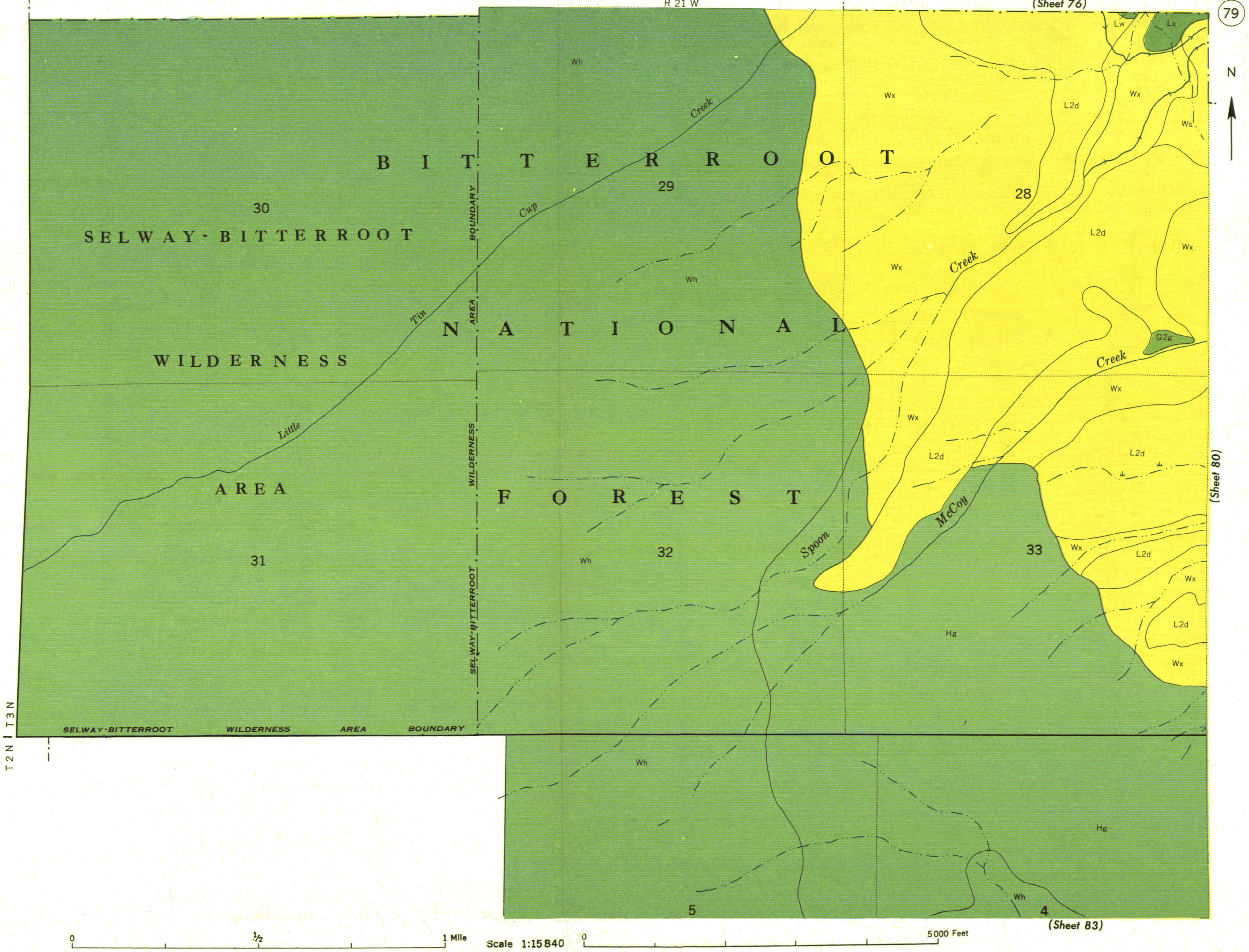


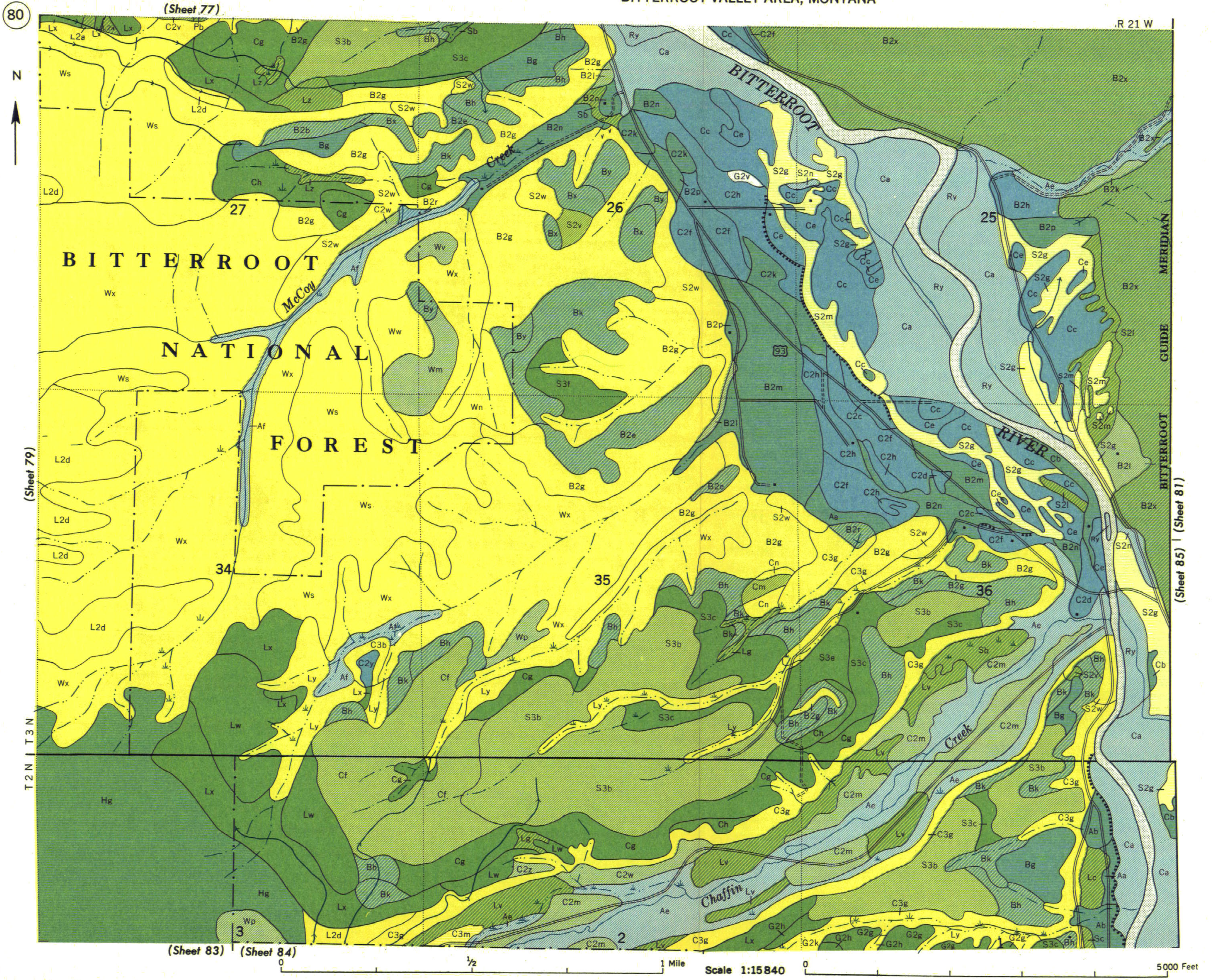
R 21 W
(Sheet 73)
N
T 3 N
B I T T E R R O O T
N A T I O N A L
F O R E S T
Tin Cup Creek
Little Tin Cup Creek
SELWAY-BITTERROOT WILDERNESS AREA BOUNDARY
(Sheet 77)
(Sheet 79)
7
8
9
16
17
18
19
20
21
Wh
Wx
Wr
Ws
Ae
C2h
C2n
L2d
L2e
Ly
Lx
Lw
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

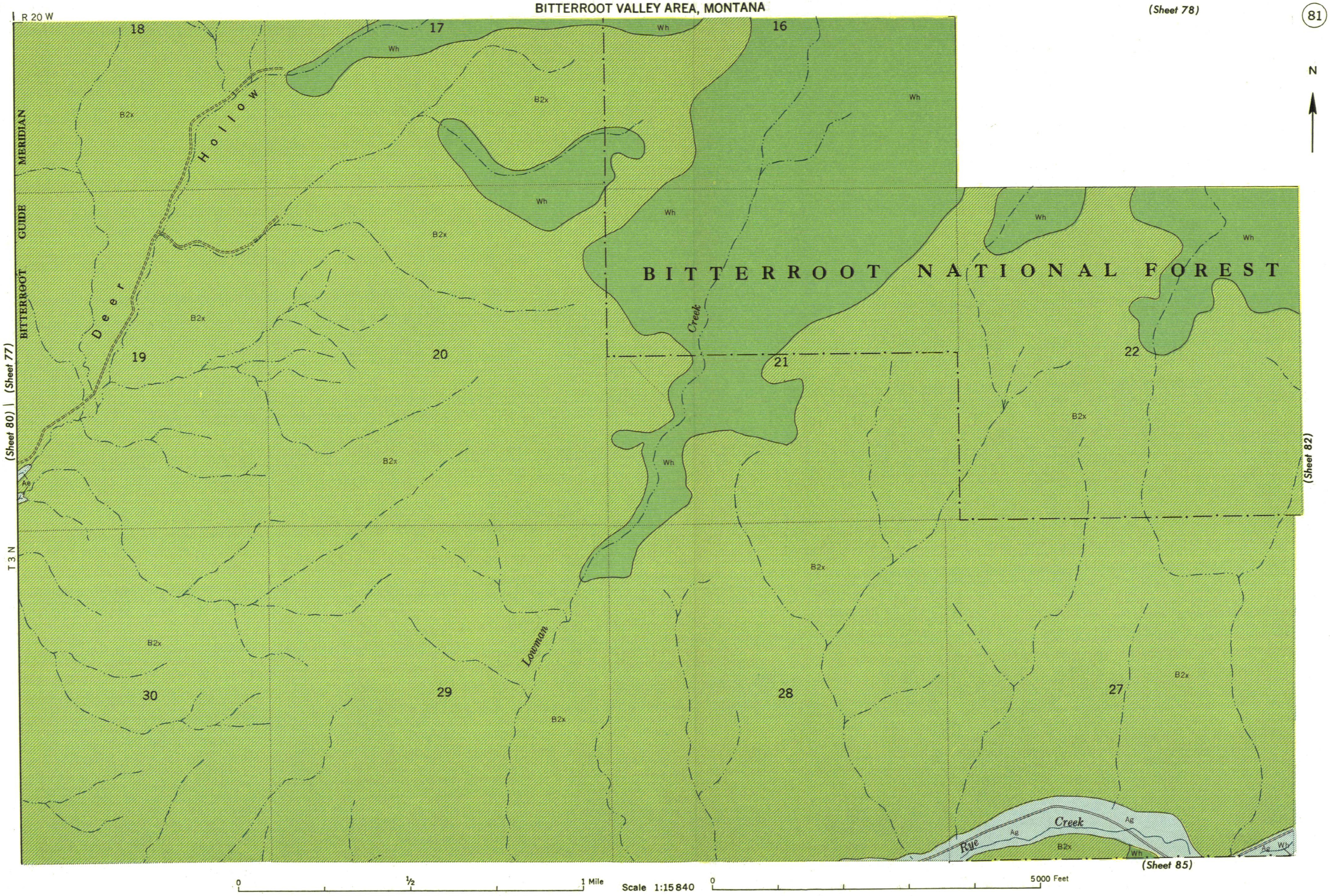


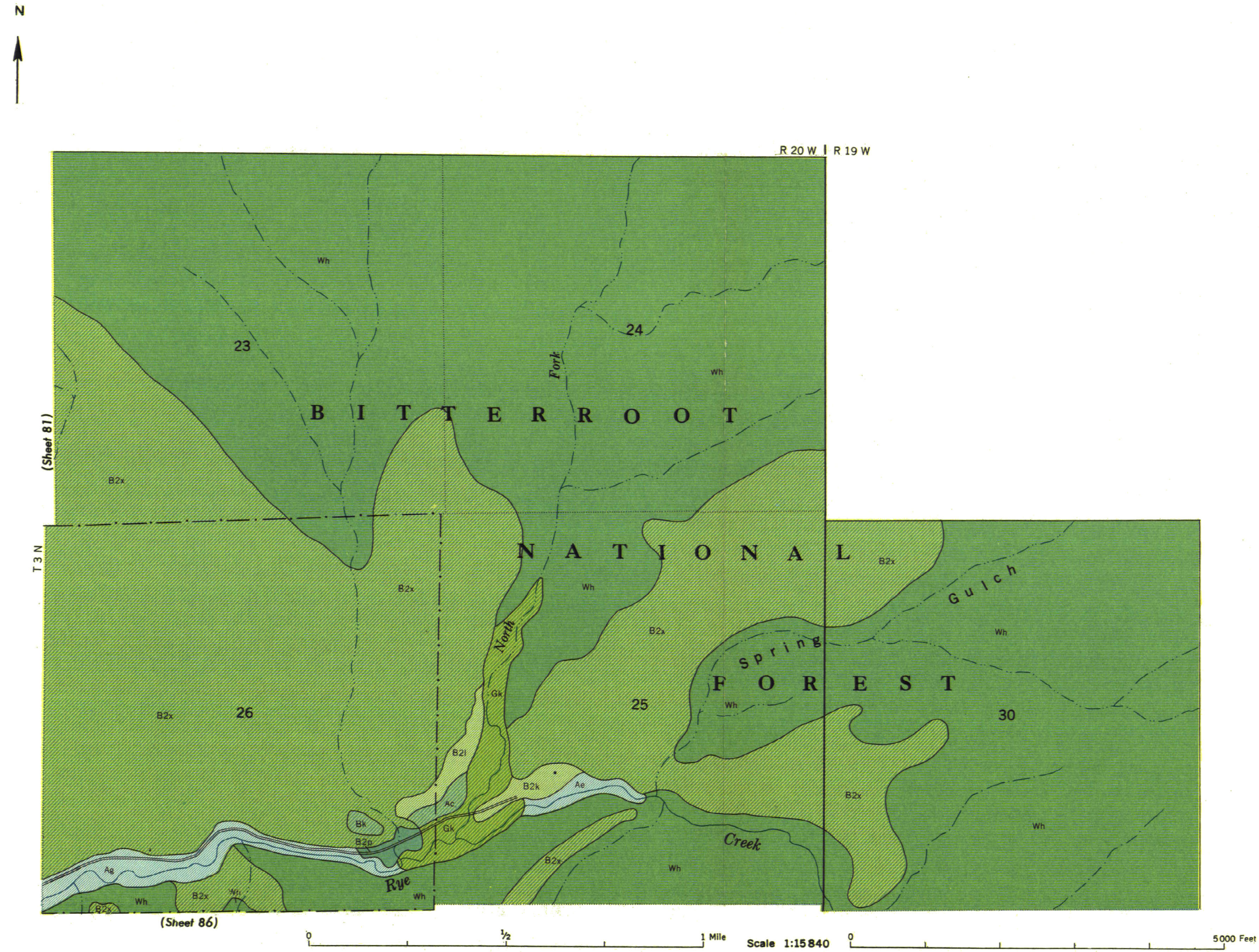
Scale 1:15840

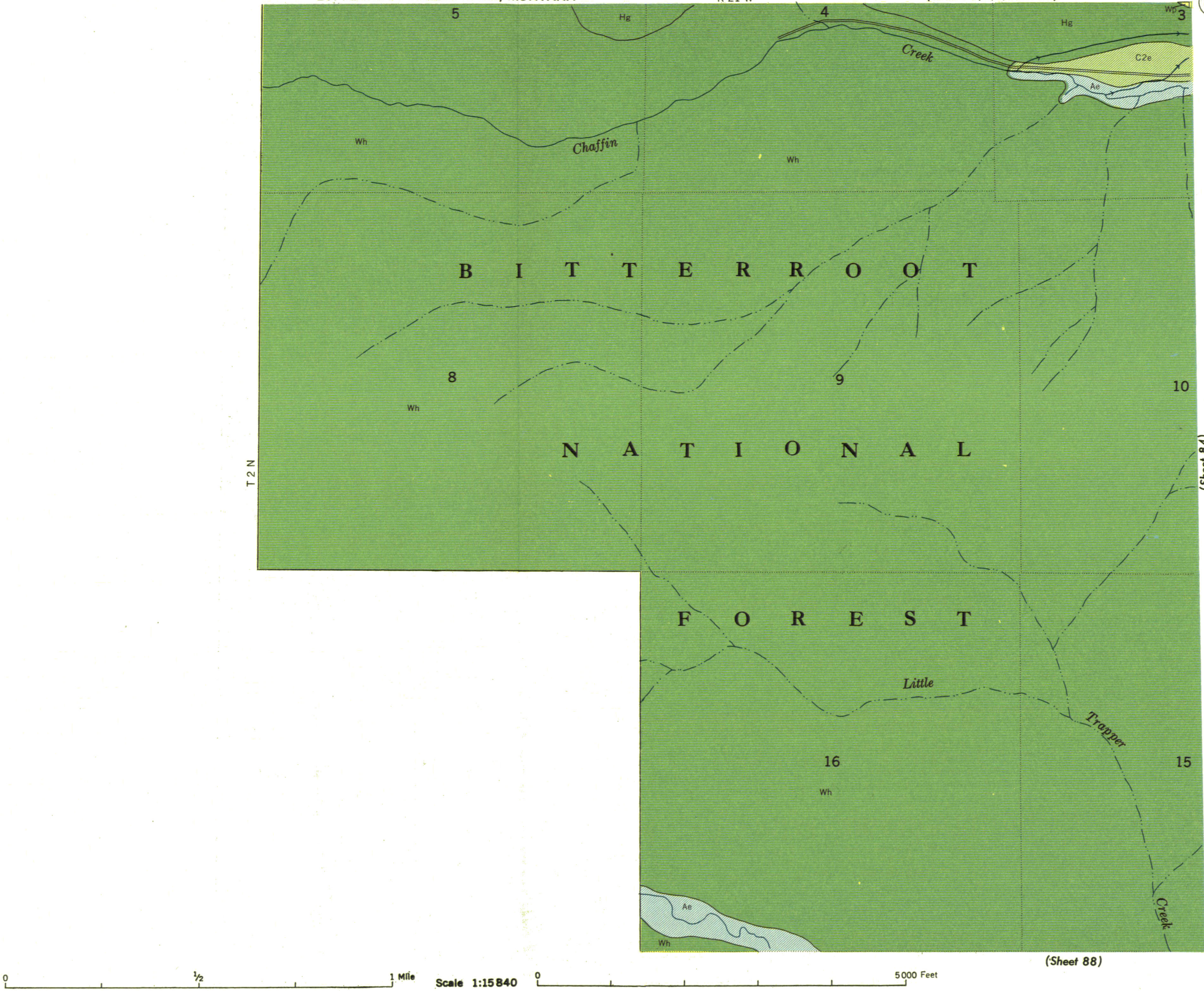

R 20 W
(Sheet 75)
T 3 N
N
GUIDE MERIDIAN
BITTERROOT FOREST BOUNDARY
(Sheet 77) | (Sheet 74)
Wh
B2x
Stella Creek
6
BITTERROOT NATIONAL FOREST
Gulch
Burke
7
18
17
16
Deer Hollow
Lowman Creek
(Sheet 81)
0
½
1 Mile
Scale 1:15 840
5000 Feet

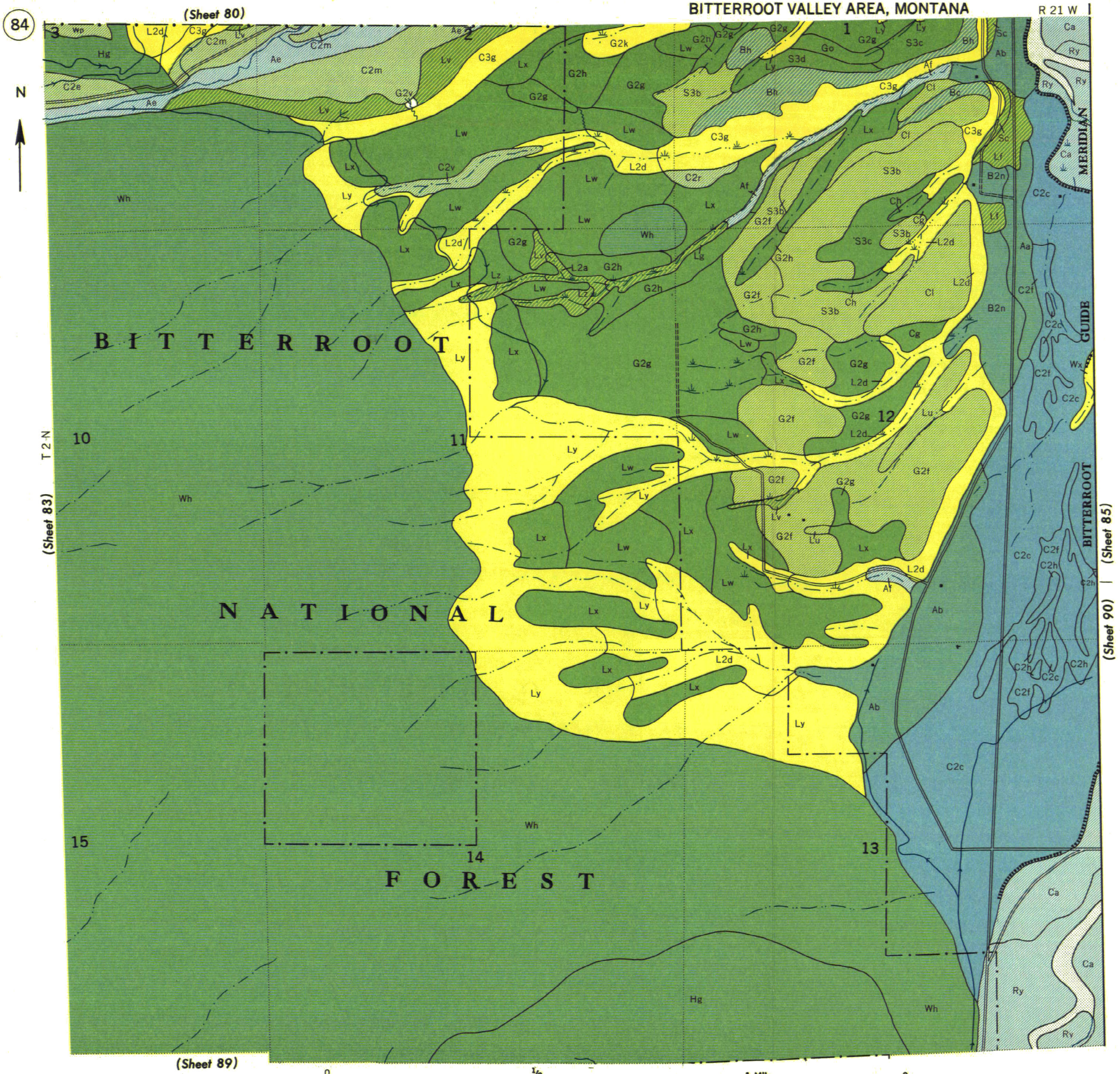

R 21 W
(Sheet 76)
(Sheet 80)
(Sheet 83)
N
T 3 N
T 2 N
BITTERROOT
NATIONAL
FOREST
SELWAY-BITTERROOT
WILDERNESS
AREA
SELWAY-BITTERROOT WILDERNESS AREA BOUNDARY
30
29
28
31
32
33
5
4
Little Tin Cup Creek
Creek
Creek
McCoy
Spoon
Wh
Wx
L2d
Lw
Lx
Ws
G2g
Hg
0
½
1 Mile
Scale 1:15 840
5000 Feet


(Sheet 77)
R 21 W
N
BITTERROOT NATIONAL FOREST
McCoy Creek
BITTERROOT RIVER
Chaffin Creek
Creek
93
27
26
25
34
35
36
3
2
BITTERROOT GUIDE MERIDIAN
(Sheet 79)
(Sheet 81)
(Sheet 85)
(Sheet 83)
(Sheet 84)
T 3 N
T 2 N
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

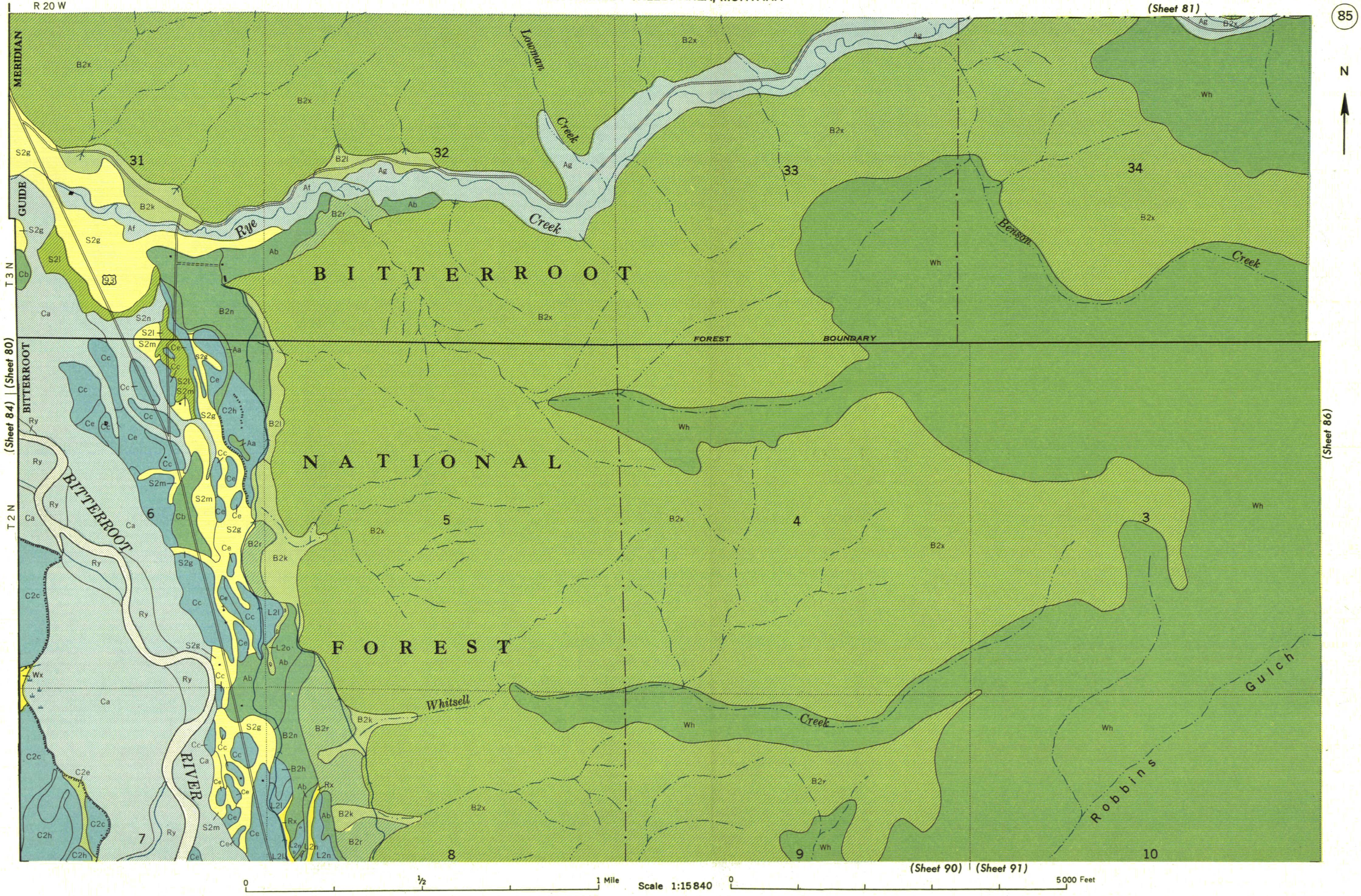

N
R 20 W
BITTERROOT GUIDE MERIDIAN
T 3 N
(Sheet 77)
(Sheet 80)
(Sheet 82)
(Sheet 85)
BITTERROOT NATIONAL FOREST
Deer Hollow
Creek
Lowman
Rye Creek
16
17
18
19
20
21
22
27
28
29
30
Wh
B2x
Ae
Ag
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

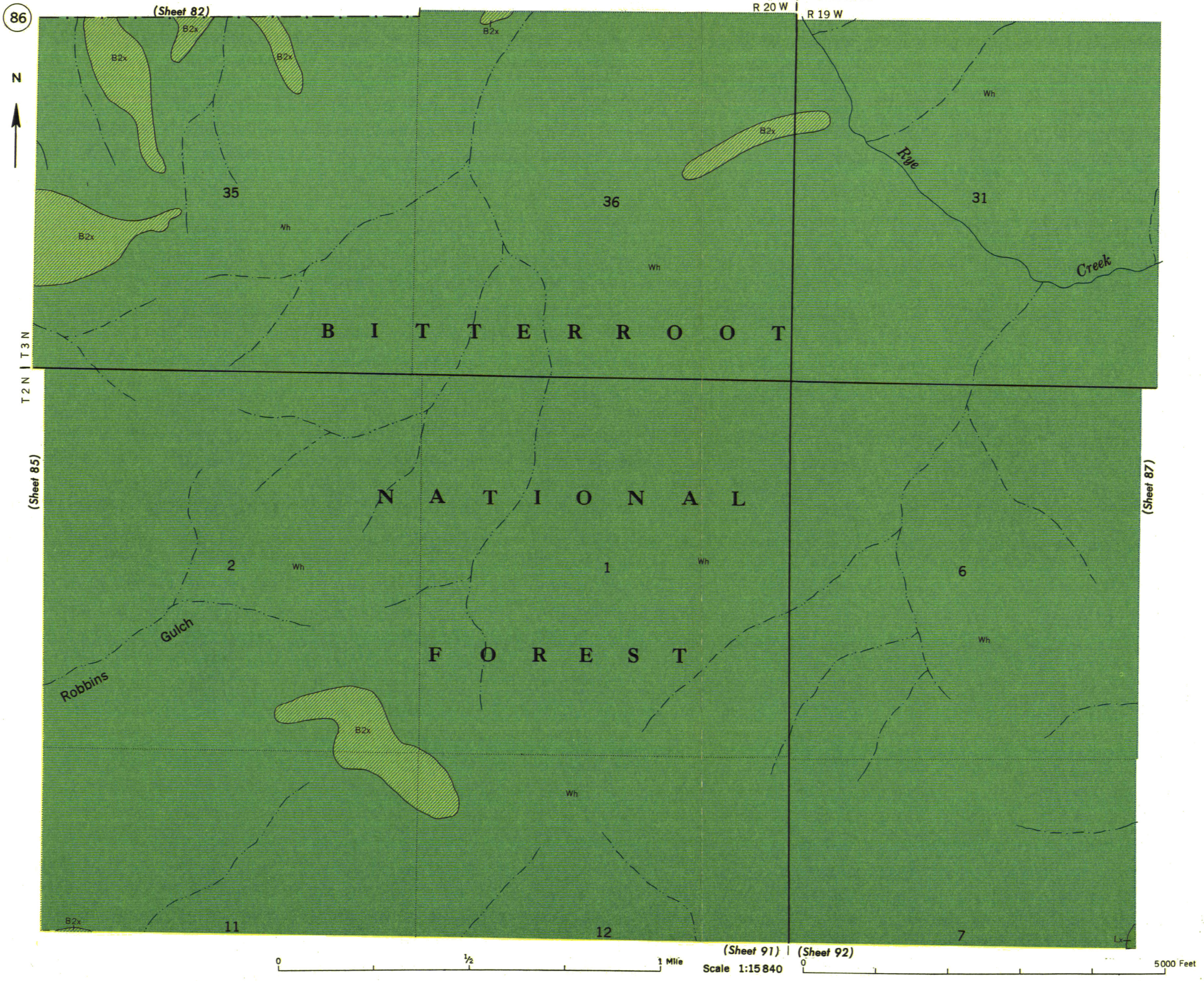

N
R 20 W
R 19 W
T 3 N
(Sheet 81)
(Sheet 86)
BITTERROOT
NATIONAL
FOREST
23
24
25
26
30
Wh
B2x
B2l
B2k
B2p
Gk
Ae
Ac
Ag
Bk
North
Fork
Spring
Gulch
Rye
Creek
0
½
1 Mile
Scale 1:15840
0
5000 Feet

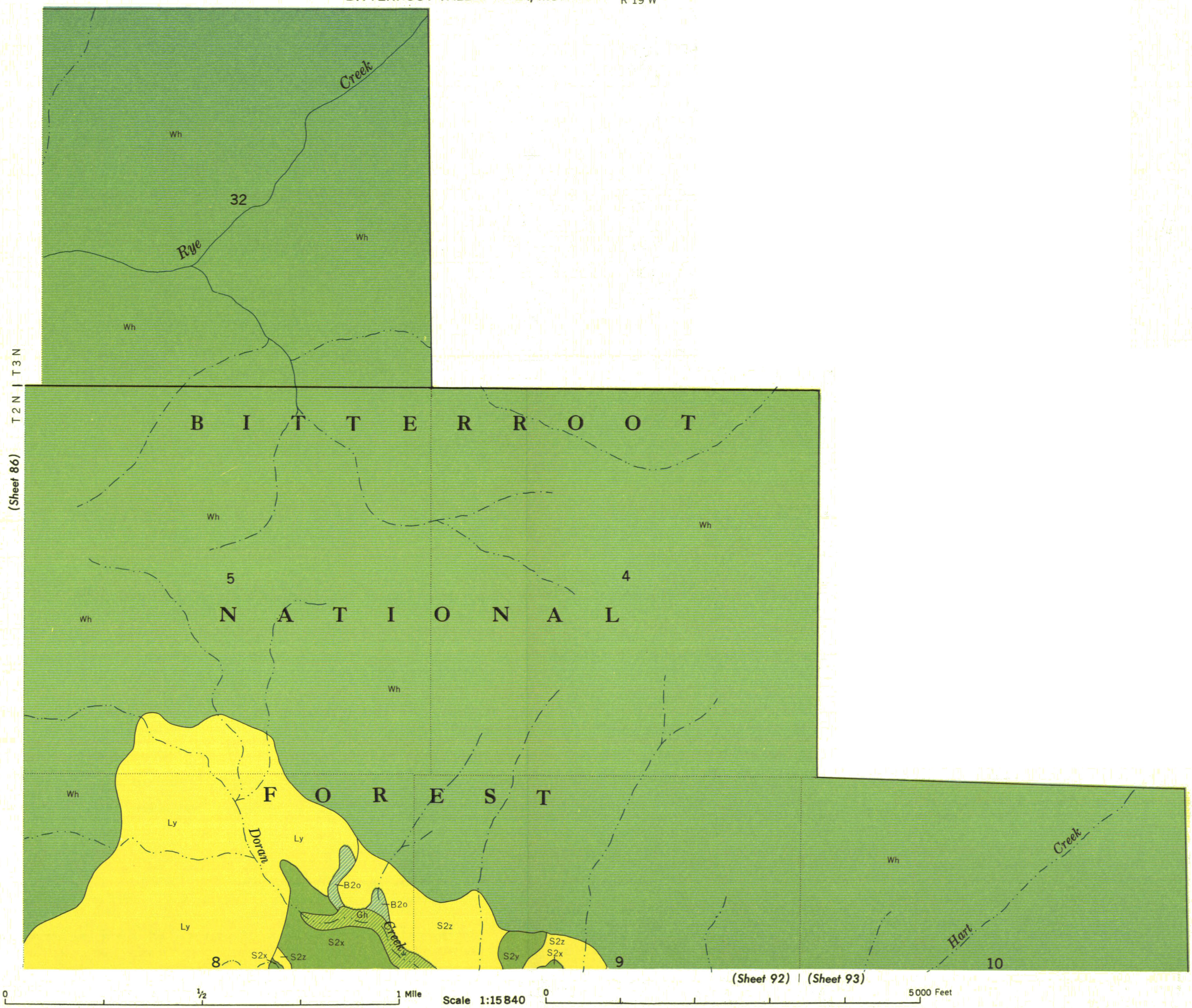

R 21 W
(Sheet 79)
(Sheet 80)
N
T 2 N
(Sheet 84)
(Sheet 88)
5
4
3
8
9
10
16
15
Hg
Wp
C2e
Ae
Wh
Chaffin
Creek
Little
Trapper
Creek
BITTERROOT
NATIONAL
FOREST
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

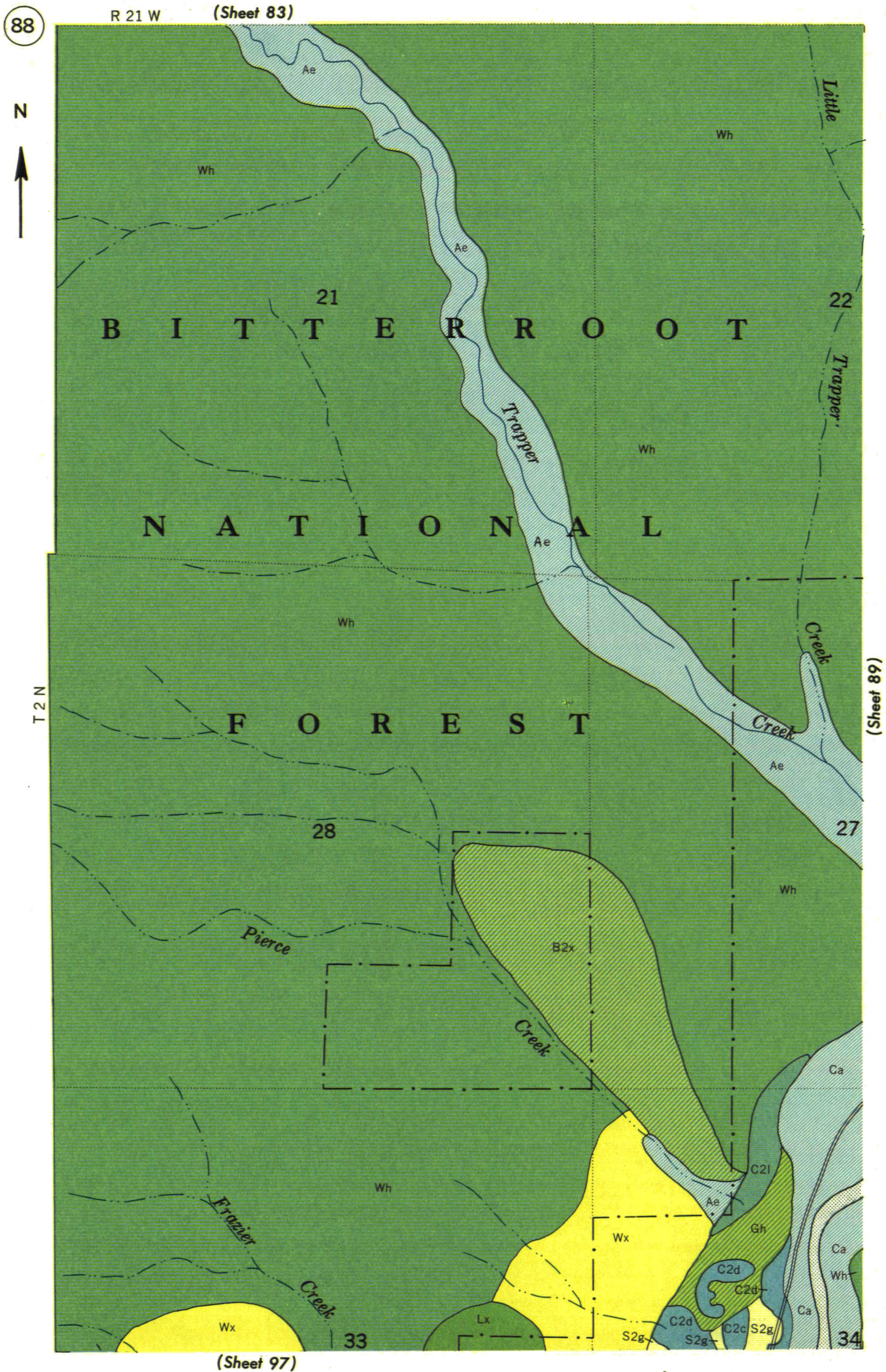


0 ½ 1 Mile Scale 1:15 840 0 5000 Feet


R 20 W
MERIDIAN
GUIDE
BITTERROOT
T 3 N
T 2 N
(Sheet 81)
(Sheet 80)
(Sheet 84)
(Sheet 86)
(Sheet 90)
(Sheet 91)
N
BITTERROOT
NATIONAL
FOREST
FOREST BOUNDARY
Lowman Creek
Rye Creek
Benson Creek
Whitsell Creek
Robbins Gulch
BITTERROOT RIVER
93
31
32
33
34
6
5
4
3
7
8
9
10
0
½
1 Mile
Scale 1:15 840
0
5000 Feet


(Sheet 82)
R 20 W
R 19 W
N
B2x
Wh
35
36
31
Rye
Creek
B I T T E R R O O T
N A T I O N A L
F O R E S T
T 3 N
T 2 N
(Sheet 85)
(Sheet 87)
2
1
6
Robbins
Gulch
11
12
7
Lx
(Sheet 91)
(Sheet 92)
0
½
1 Mile
Scale 1:15 840
5000 Feet

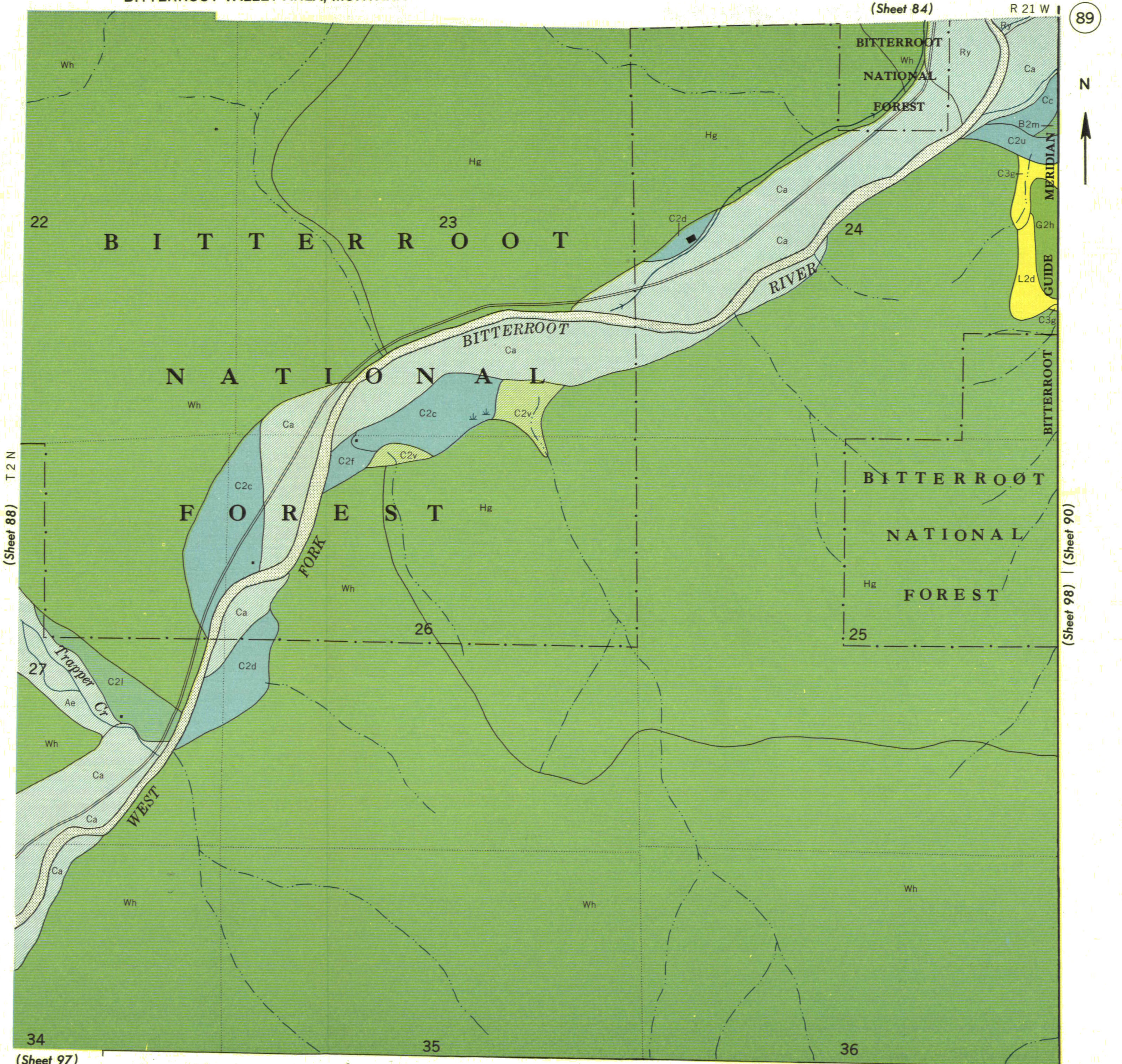

R 19 W
N
T 3 N
T 2 N
(Sheet 86)
Rye
Creek
32
Wh
BITTERROOT
NATIONAL
FOREST
5
4
Doran
Creek
Ly
B2o
Gh
S2x
S2z
S2y
8
9
10
Hart
Creek
(Sheet 92)
(Sheet 93)
0
½
1 Mile
Scale 1:15840
0
5000 Feet



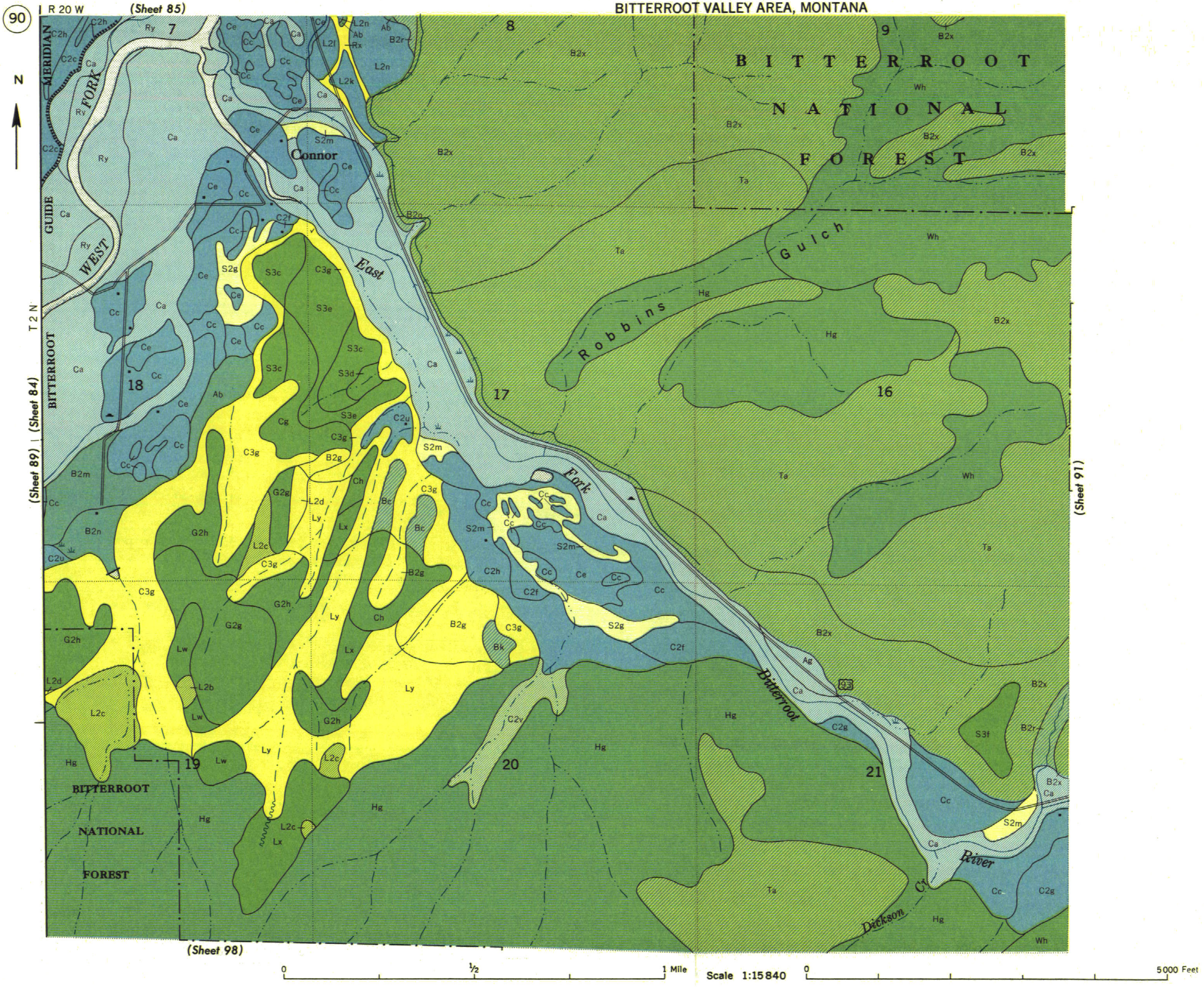
0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet



0 1/2 1 Mile Scale 1:15840 0 5000 Feet


R 20 W
(Sheet 85)
(Sheet 84)
(Sheet 89)
(Sheet 91)
(Sheet 98)
T 2 N
N
BITTERROOT NATIONAL FOREST
BITTERROOT NATIONAL FOREST
BITTERROOT GUIDE MERIDIAN
WEST FORK
Connor
East Fork
Robbins Gulch
Bitterroot River
Dickson Cr.
7
8
9
16
17
18
19
20
21
93
0
½
1 Mile
Scale 1:15 840
0
5000 Feet


(Sheet 85)
(Sheet 86)
R 20 W
N
10
11
12
Wh
B2x
B I T T E R R O O T
N A T I O N A L
F O R E S T
15
14
13
T 2 N
(Sheet 90)
(Sheet 92)
Ta
Medicine
Tree
Creek
B2r
22
23
24
Ca
Cc
C2g
E. Fork
Bitterroot River
93
(Sheet 98)
(Sheet 99)
0
1/2
1 Mile
Scale 1:15 840
5000 Feet

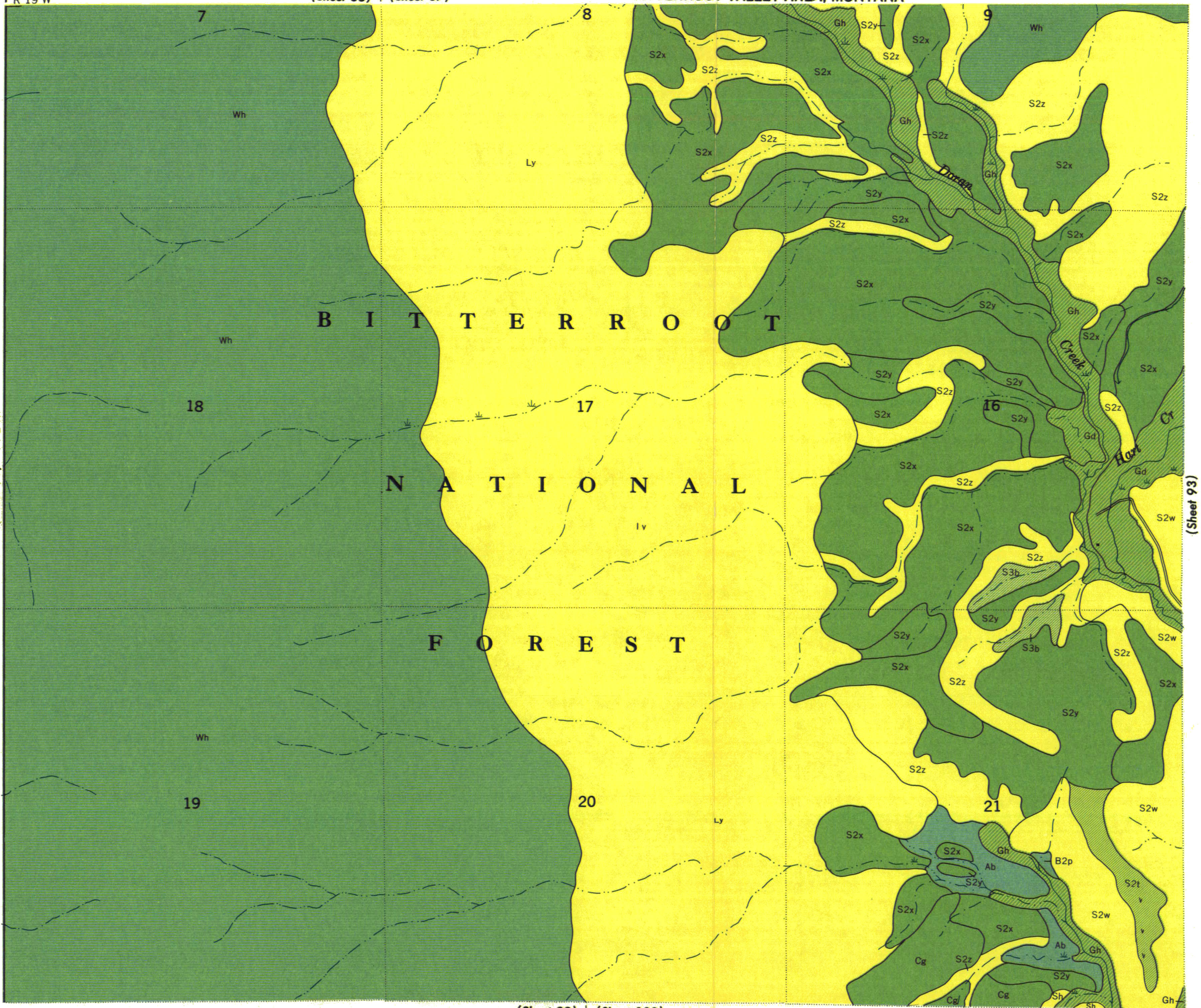
R 19 W

(Sheet 86) | (Sheet 87)

N

T 2 N

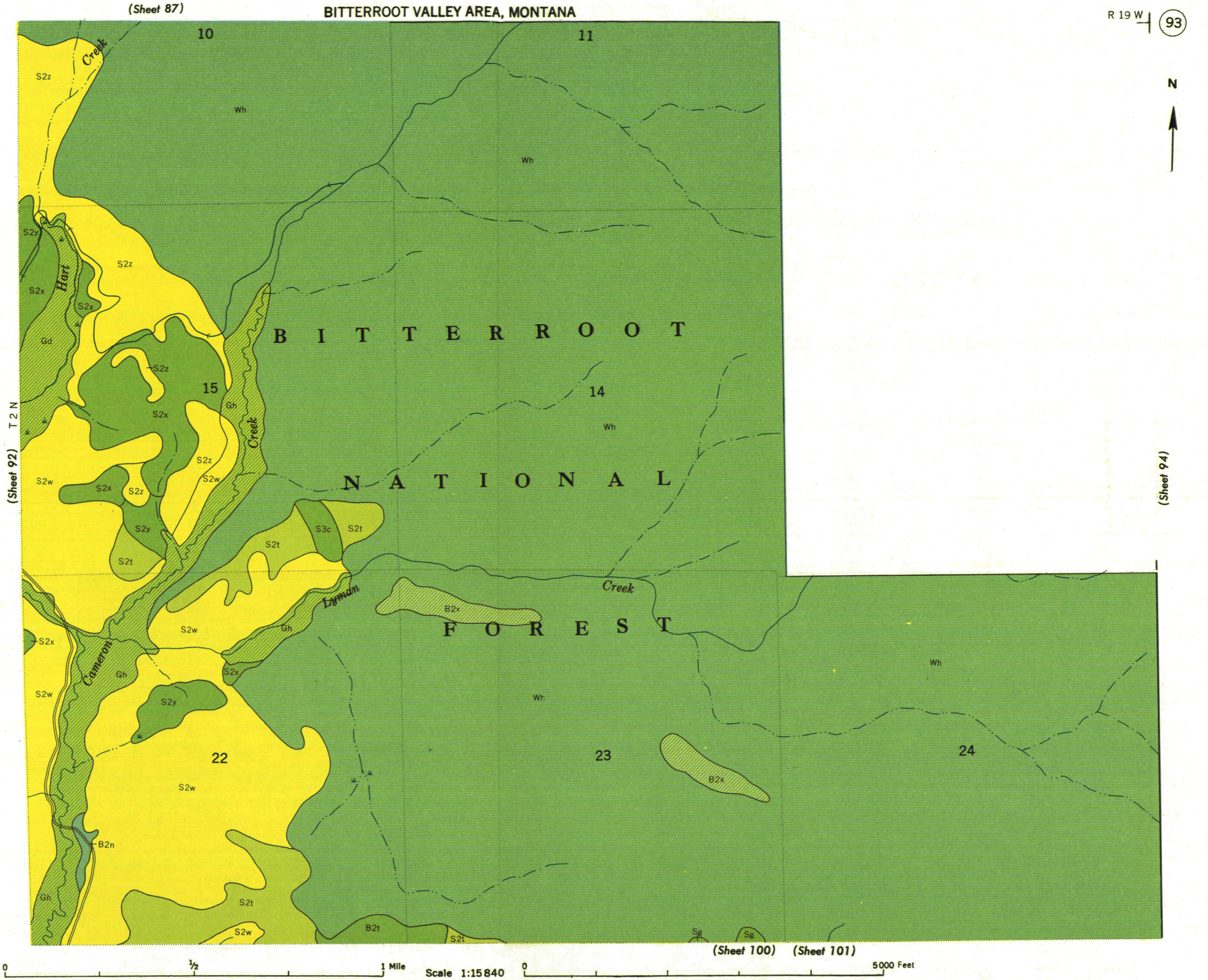
(Sheet 91)

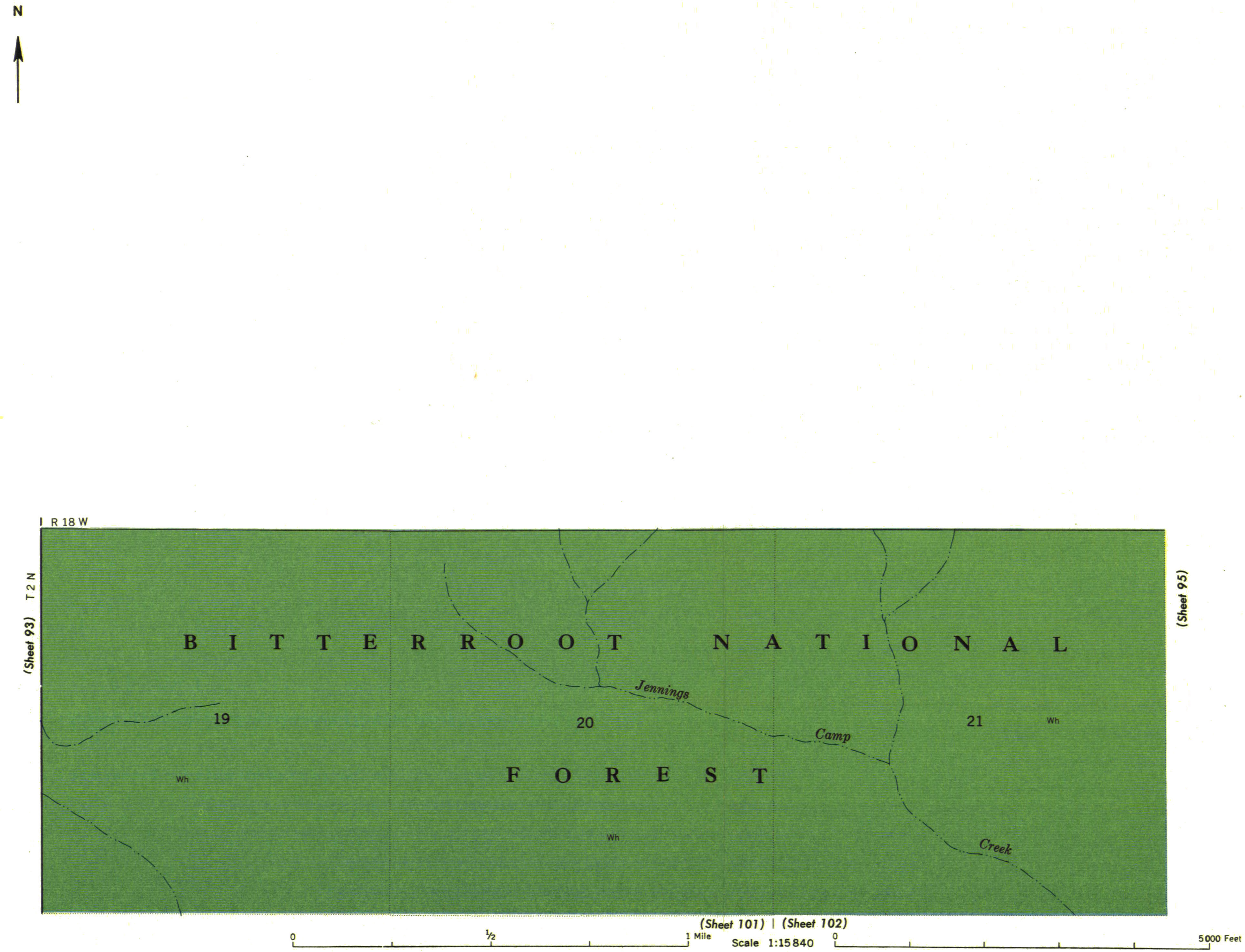


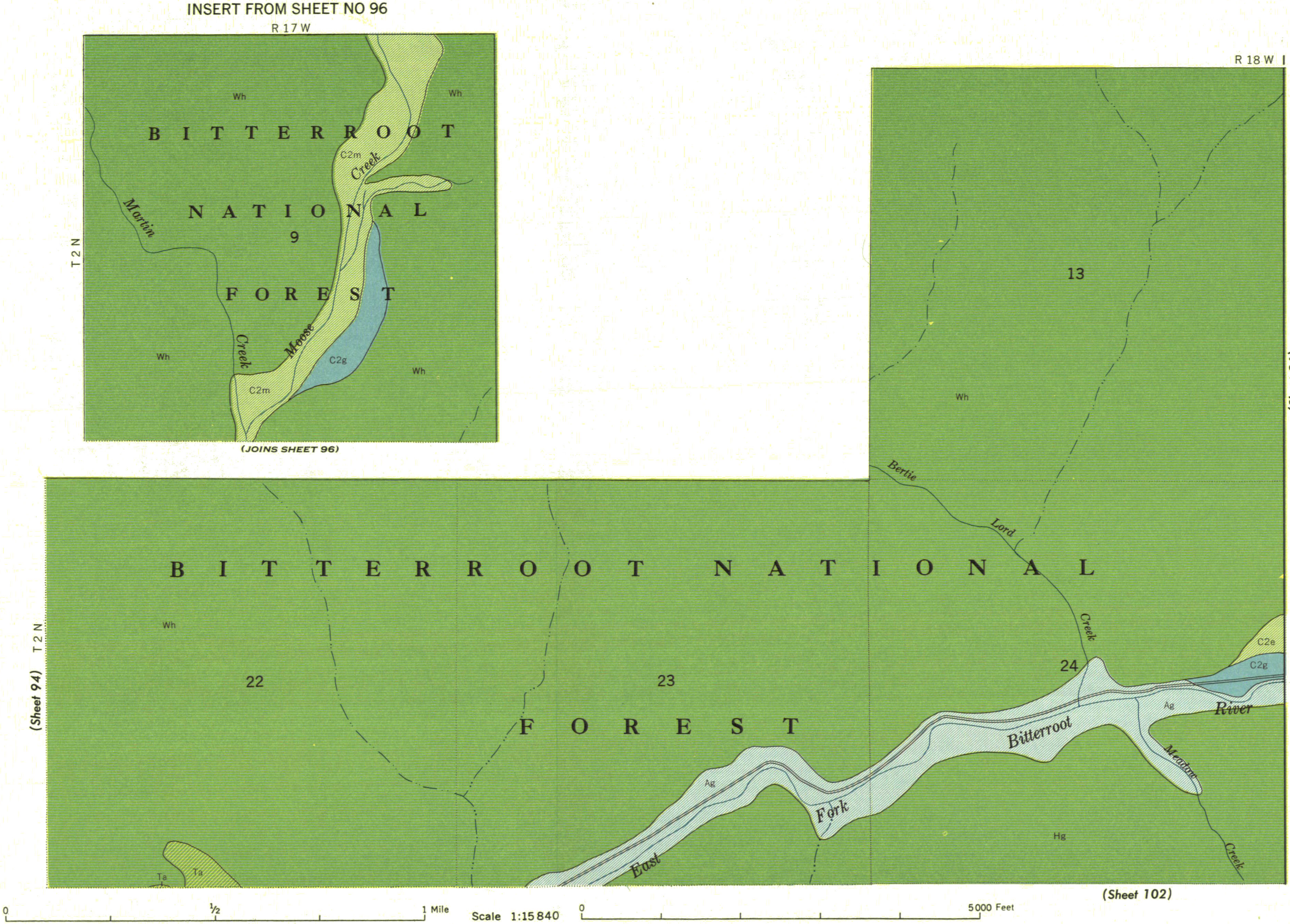
(Sheet 93)

(Sheet 99) | (Sheet 100)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet


(Sheet 87)
R 19 W
N
T 2 N
(Sheet 92)
(Sheet 94)
(Sheet 100)
(Sheet 101)
BITTERROOT NATIONAL FOREST
Hart Creek
Cameron Creek
Lyman Creek
10
11
14
15
22
23
24
Wh
S2z
S2y
S2x
S2w
S2t
S3c
Gd
Gh
B2x
B2n
B2t
Sg
0 1/2 1 Mile
Scale 1:15 840
0 5000 Feet

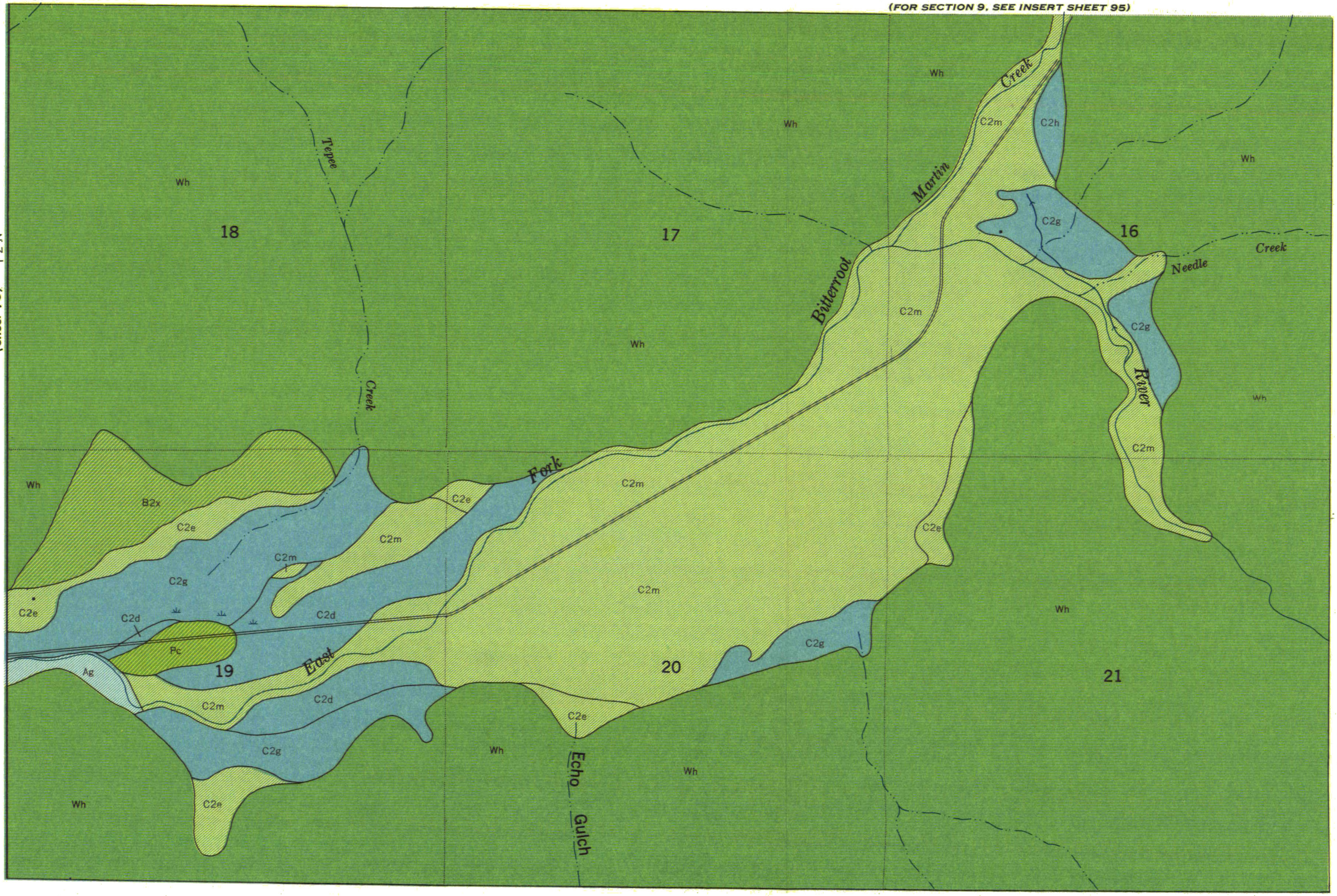

N
R 18 W
T 2 N
(Sheet 93)
(Sheet 95)
BITTERROOT NATIONAL FOREST
Jennings
Camp
Creek
19
20
21
Wh
Wh
Wh
Wh
(Sheet 101)
(Sheet 102)
0
½
1 Mile
Scale 1:15 840
0
5000 Feet



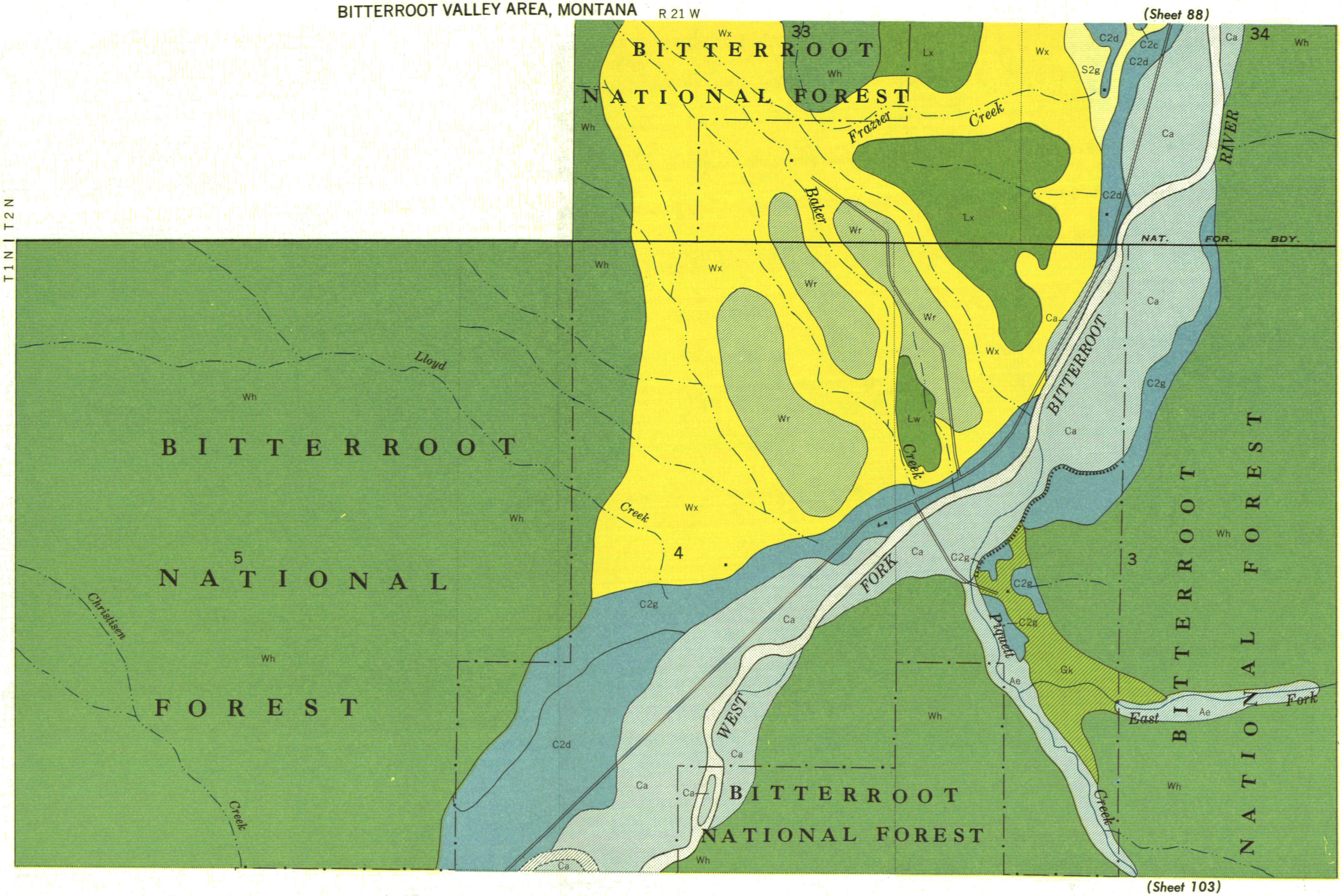
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

BITTERROOT VALLEY AREA, MONTANA

(FOR SECTION 9, SEE INSERT SHEET 95)

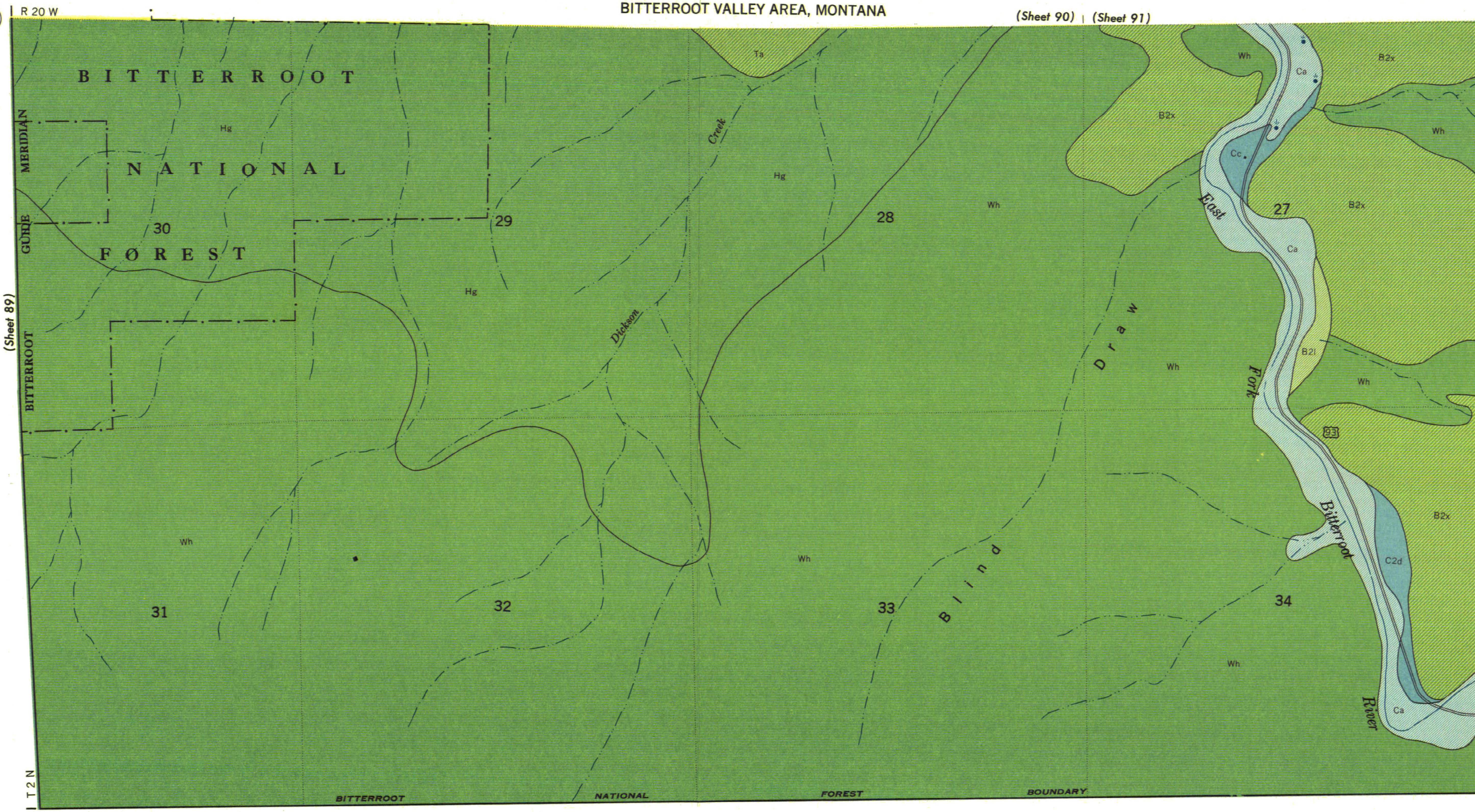


0 ½ 1 Mile Scale 1:15840 0 5000 Feet



0 ½ 1 Mile Scale 1:15840 0 5000 Feet

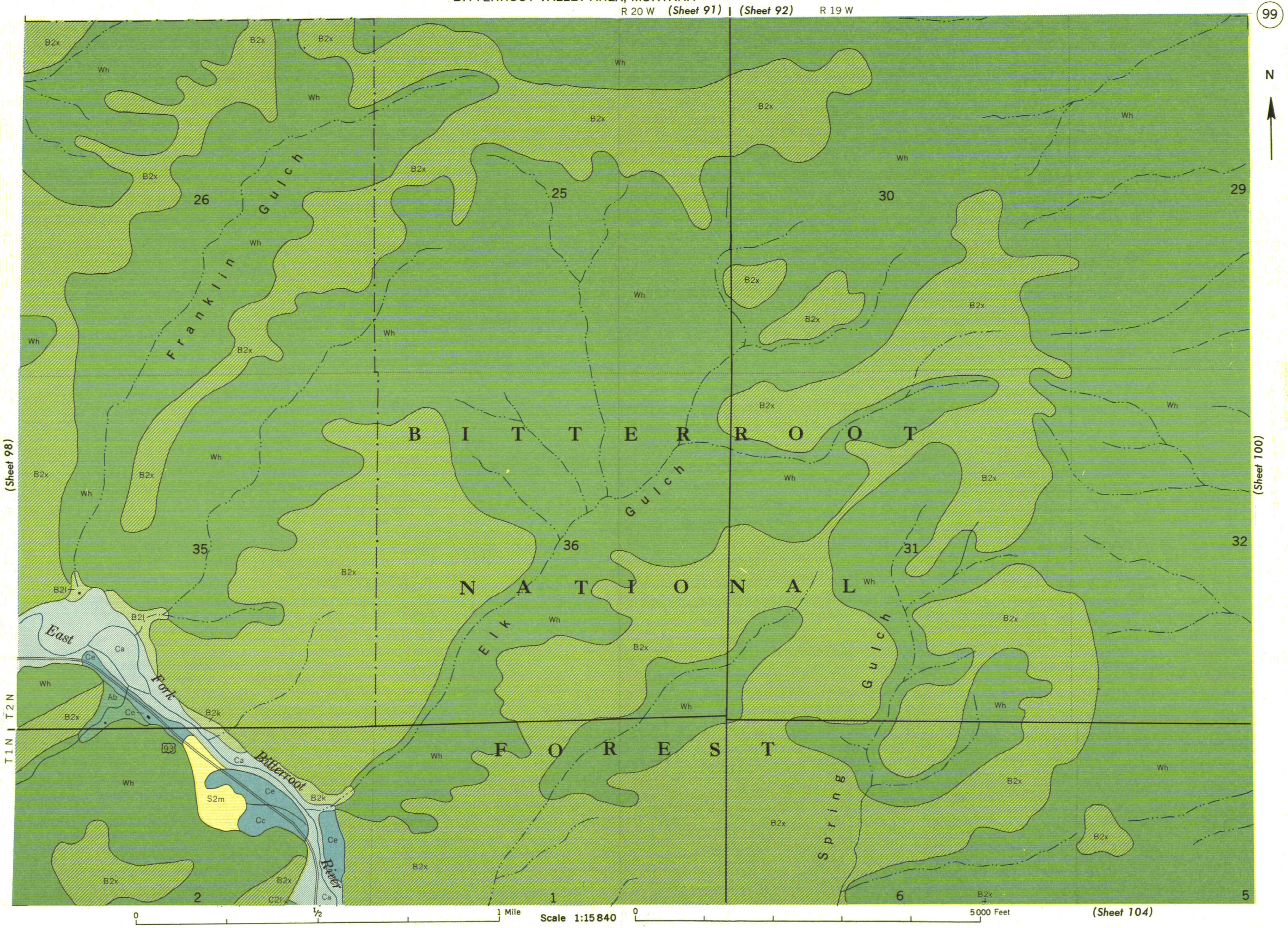
BITTERROOT VALLEY AREA, MONTANA



Scale 1:15 840

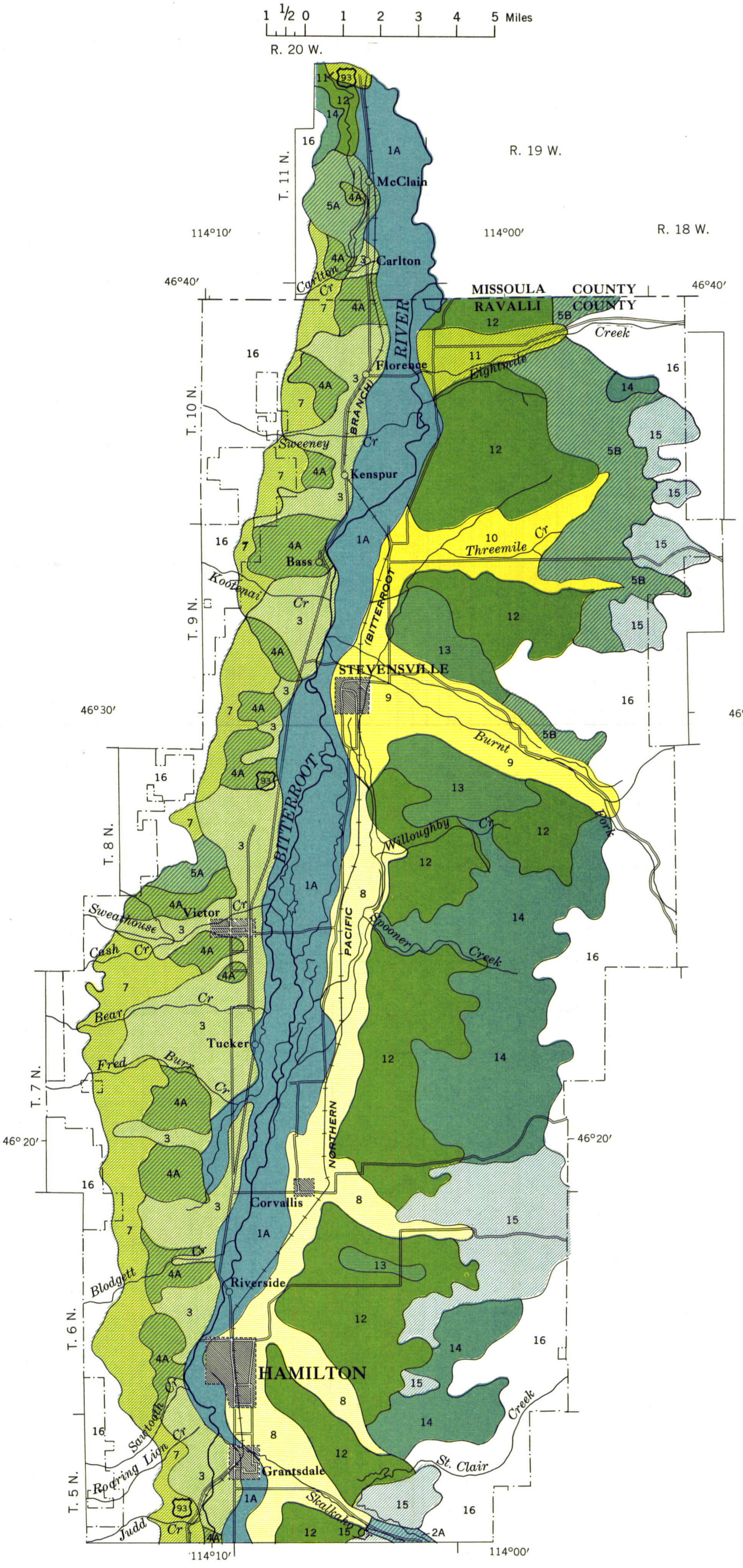
0 ½ 1 Mile

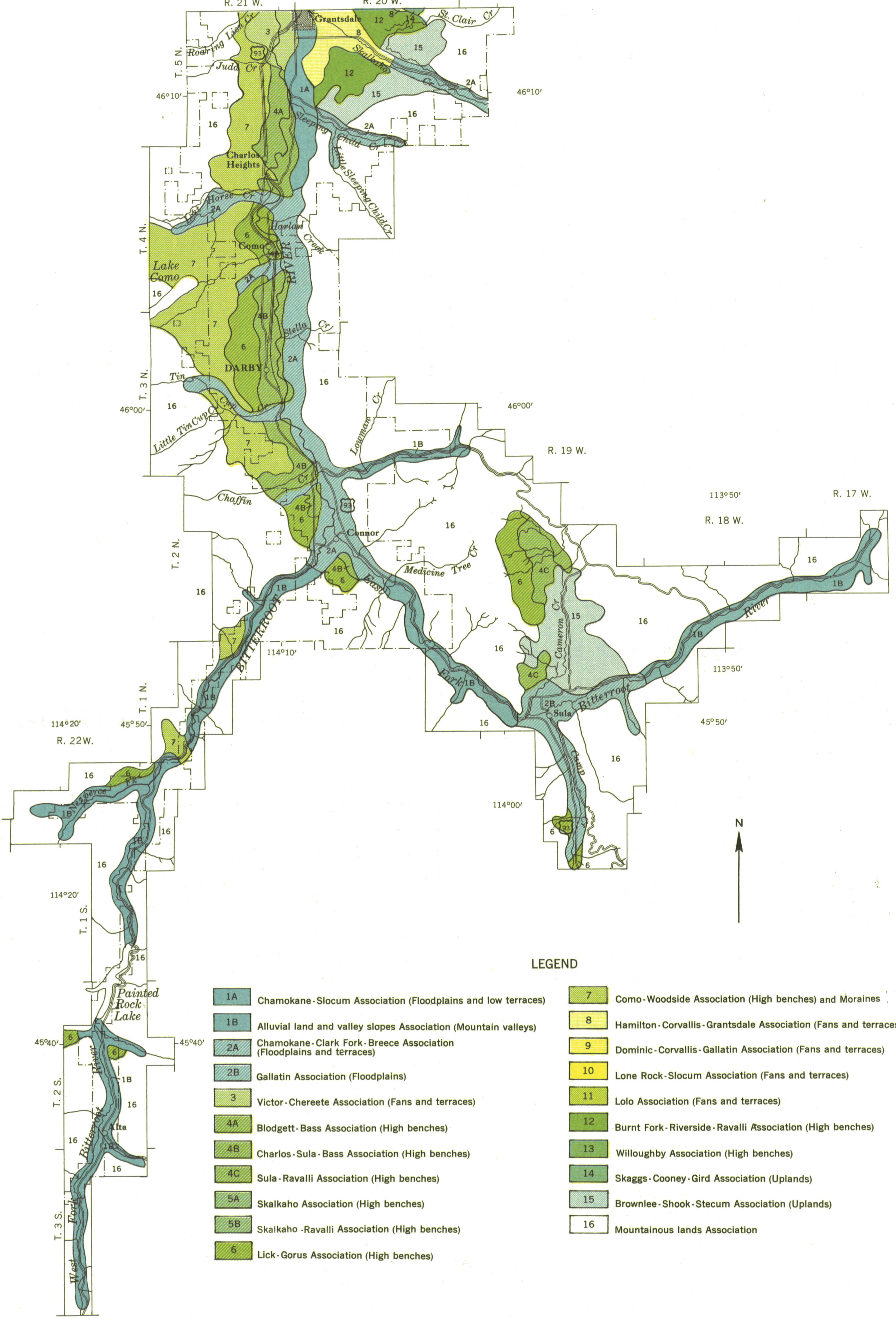
0 5000 Feet


R 20 W (Sheet 91) | (Sheet 92) R 19 W
N
BITTERROOT NATIONAL FOREST
Franklin Gulch
Elk Gulch
Spring Gulch
East Fork Bitterroot River
26
25
30
29
35
36
31
32
2
1
6
5
T 2 N
T 1 N
(Sheet 98)
(Sheet 100)
(Sheet 104)
93
B2x
Wh
B2k
B2l
Ca
Ce
Cc
Ab
S2m
C2l
0 1/2 1 Mile
Scale 1:15 840
0 5000 Feet

SOIL ASSOCIATIONS

BITTERROOT VALLEY AREA, MONTANA





LEGEND

- 1A Chamokane-Slocum Association (Floodplains and low terraces)
- 1B Alluvial land and valley slopes Association (Mountain valleys)
- 2A Chamokane-Clark Fork-Breece Association (Floodplains and terraces)
- 2B Gallatin Association (Floodplains)
- 3 Victor-Chereete Association (Fans and terraces)
- 4A Blodgett-Bass Association (High benches)
- 4B Charlos-Sula-Bass Association (High benches)
- 4C Sula-Ravalli Association (High benches)
- 5A Skalkaho Association (High benches)
- 5B Skalkaho-Ravalli Association (High benches)
- 6 Lick-Gorus Association (High benches)
- 7 Como-Woodside Association (High benches) and Moraines
- 8 Hamilton-Corvallis-Grantsdale Association (Fans and terraces)
- 9 Dominic-Corvallis-Gallatin Association (Fans and terraces)
- 10 Lone Rock-Slocum Association (Fans and terraces)
- 11 Lolo Association (Fans and terraces)
- 12 Burnt Fork-Riverside-Ravalli Association (High benches)
- 13 Willoughby Association (High benches)
- 14 Skaggs-Cooney-Gird Association (Uplands)
- 15 Brownlee-Shook-Stecum Association (Uplands)
- 16 Mountainous lands Association

BITTERROOT VALLEY AREA, MONTANA

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Roads

- Good motor
- Poor motor
- Trail
- Marker, U. S. — 33

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail, foot
- Railroad
- Ferry
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings

- School
- Church
- Station

Mine and Quarry

- Shaft
- Dump
- Mine tunnel (opening)
- (showing direction)

Pits, gravel or other

Power line

Pipeline

Cemetery

Dam

Levee

Tank

Oil well

Windmill

Canal lock (point upstream)

BOUNDARIES

- National or state
- County
- Township, civil
- U. S.
- Section
- City (corporate)
- Reservation
- Land grant

DRAINAGE

Streams

- Perennial
- Intermittent, unclass.
  - Crossable with tillage implements
  - Not crossable with tillage implements

Canals and ditches — CANAL, DITCH

Lakes and ponds

- Perennial
- Intermittent

Wells — flowing

Springs

Marsh

Wet spot

RELIEF

Escarpments

Prominent peaks

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

Soil type outline and symbol	Dx
Gravel	
Stone, stone pile	
Rock outcrops	
Chert fragments	
Clay spot	
Sand spot	
Gumbo or scabby spot	
Made land	

Erosion

Uneroded spot	U
Sheet, moderate	S
Sheet, severe	SS
Gully, moderate	G
Gully, severe	GG
Sheet and gully, moderate	SG
Wind, moderate	
Wind, severe	
Blowout	
Wind hummock	
Overblown soil	

Gullies

Areas of alkali and salts

Strong	A
Moderate	M
Slight	S
Free of toxic effect	F
Sample location	• 26
Saline spot	+